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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 11
JUNE 1, 1977

W77-05101 – W77-05600

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
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07 RESOURCES DATA
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08 ENGINEERING WORKS
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SELECTED WATER RESOURCES ABSTRACTS

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Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 2B.
W77-05109

HYDROLOGIC MODEL OF A WETLAND FOREST--DETAILS OF CONSTRUCTION,
Southeastern Forest Experiment Station, Asheville, N.C.
For primary bibliographic entry see Field 4D.
W77-05115

HYDROGRAPH ANALYSIS: A COMPUTERIZED SEPARATION TECHNIQUE,
Intermountain Forest and Range Experiment Station, Moscow, Idaho.
For primary bibliographic entry see Field 4A.
W77-05117

A NONLINEAR KINEMATIC WAVE MODEL FOR WATERSHED SURFACE RUNOFF,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W77-05140

SUSTAINED FLOW IN SMALL APPALACHIAN WATERSHEDS UNDERLAIN BY CARBONATE ROCKS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2F.
W77-05143

EVIDENCE FOR NONSTATIONARITY AS A PHYSICAL EXPLANATION OF THE HURST PHENOMENON,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 2B.
W77-05165

A DISTRIBUTED CONVERGING OVERLAND FLOW MODEL 3. APPLICATION TO NATURAL WATERSHEDS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W77-05168

MODELING MONTHLY HYDROLOGIC PERSISTENCE,
Catholic Univ. of America, Washington, D. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-05177

A VARIABLE SOURCE AREA MODEL OF THE RAINFALL-RUNOFF PROCESS BASED ON THE WATERSHED STREAM NETWORK,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
M. T. Lee, and J. W. Delleur.
Water Resources Research, Vol. 12, No. 5, p 1029-1036, October 1976. 5 fig, 1 tab, 37 ref. OWRT B-008-IND(16).

Descriptors: *Rainfall-runoff relationships, *Storms, *Model studies, Watersheds(Basins), Storm runoff, Streams, Precipitation(Atmospheric), Precipitation excess, Stochastic processes, Watershed management, Travel time, Synthetic hydrology.
Identifiers: *Watershed stream network, Stochastic systems, Deterministic systems, First-order streams, Synthesized streamflow, Basin outlet, St. Venant equations.

A model of the dynamic contributing area during a storm was formulated in terms of the history of precipitation in excess of B horizon permeability. The spatial dynamic contributing area along the main stream was obtained under the following assumptions: the velocity of flow along the stream network was uniform, the drainage density was a constant within a given watershed, and the first-order streams were uniformly distributed in the basin. The runoff from the dynamic contributing area was then routed through the synthesized stream network to obtain the direct runoff at the basin outlet by making use of a method based on the linearized St. Venant equations. The model was tested in several watersheds in the central United States. (Roberts-ISWS)
W77-05178

AN EVALUATION OF THE PRACTICALITY AND COMPLEXITY OF SOME RAINFALL AND RUNOFF TIME SERIES MODELS,
Purdue Univ., Lafayette, Ind. School of of Civil Engineering.
J. W. Delleur, P. C. Tao, and M. L. Kavvas.
Water Resources Research, Vol. 12, No. 5, p 953-970, October 1976. 9 fig, 6 tab, 41 ref. OWRT B-036-IND(13).

Descriptors: *Runoff, *Rainfall, *Time series analysis, *Model studies, Precipitation(Atmospheric), Seasonal, Monthly, Flow, Analytical techniques, Mathematical models, Statistics, Forecasting, Meteorology, Hydrology.

The fundamental issue of what level of complexity is needed in stochastic models for generating or forecasting hydrologic events was studied by comparing the properties of autoregressive, moving average, and mixed models of increasing complexity for annual, monthly, weekly, and daily series. Several methods of removing seasonal non-homogeneity of monthly series were compared, and the seasonality of monthly model coefficients was investigated. For small time increments, a harmonic analysis of the coefficients is necessary to limit the number of parameters. The relative goodness of fit of several models of monthly and daily series were determined by diagnostic checks applied to the residuals, and their probability distributions were investigated. The issue of long-range versus short-range dependence was analyzed by comparing the statistics describing the span of dependence of several time series models. The need for compatible models for different time resolutions was discussed. The merits of the disaggregation model and its level of complexity were discussed and compared with those of other models. (Sims-ISWS)
W77-05179

A POINT STOCHASTIC MODEL FOR CONTINENTAL DROUGHTS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2B.
W77-05183

VARIATION OF LINK MAGNITUDE WITH MAP SCALE,
South Carolina Univ., Columbia. Dept. of Geology.
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W77-05338

RAINFALL NETWORK DESIGN FOR RUNOFF PREDICTION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W77-05341

CRITICAL DURATION OF RAINFALL FOR FLOOD ESTIMATION,
Darling Downs Inst. of Advanced Education, Toowoomba (Australia).
For primary bibliographic entry see Field 2B.
W77-05342

NUMERICAL TIDAL MODEL OF CHESAPEAKE BAY,
National Oceanic and Atmospheric Administration, Princeton, N. J. Geophysical Fluid Dynamics Lab.
For primary bibliographic entry see Field 2L.
W77-05356

A STOCHASTIC SNOW MODEL,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2C.
W77-05489

2B. Precipitation

ESTIMATION OF AREAL AVERAGE PRECIPITATION USING DIFFERENT NETWORK DENSITIES AND AVERAGING TECHNIQUES,
Delaware Univ., Newark. Water Resources Center.
J. R. Mather.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 243, Price codes: A06 in paper copy, A01 in microfiche. Completion Report, December 1975. 105 p, 7 fig, 24 tab, 21 ref, 2 append. OWRT A-029-DEL(1).

Descriptors: *Precipitation(Atmospheric), Areal, Hydrologic budget, *Computer programs, *Estimating, Average, *New Jersey, Monthly, Mapping.
Identifiers: *Computer mapping programs, *Areal average precipitation.

A three-year record of monthly precipitation from a 10-station National Weather Service network, from a 27-station network operated by Thornthwaite Associates, and from the combined 37-station network located in a two-county area in southern New Jersey was used to evaluate alternative network densities for estimating precipitation for water resources purposes; evaluate several different methods of estimating areal average precipitation over a region; and determine the reliability of estimated patterns of precipitation as network density changes. Only very small differences in monthly areal average precipitation were found using three different estimating techniques--arithmetic averaging of station values, weighting of point observations by construction of Thiessen polygons, and by evaluation of isohyetal patterns drawn by a SYMAP computer program. Similarly, while marked differences in monthly precipitation patterns occurred with the different network densities across the relatively flat coastal plains study area, there were actually only very small differences in areal average precipitation. Use of the monthly values of areal average precipitation obtained from all combinations of averaging techniques and network densities in a water budget methodology provided nine different values of monthly computed runoff that correlated highly and equally well with measured values obtained from gaged basins in the area.
W77-05109

A DATA INTEGRATION STUDY OF LAKE ONRARIA FOR THE EPISODE JULY 19 - AUGUST 2, 1972, PART I,
Northwestern Univ., Evanston, Ill. Technological Inst.
For primary bibliographic entry see Field 2H.
W77-05125

A DATA INTEGRATION STUDY OF LAKE ONTARIO FOR THE EPISODE JULY 19 - AUGUST 2, 1972. PART II,
Northwestern Univ., Evanston, Ill. Technological Inst.
For primary bibliographic entry see Field 2H.
W77-05126

RADAR-GAGE PRECIPITATION MEASUREMENTS DURING THE IFYGL,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 2H.
W77-05130

AEROSOL IN THE GATE AREA AND ITS RADIATIVE PROPERTIES,
Leningrad State Univ. (USSR). Dept. of Atmospheric Physics.
For primary bibliographic entry see Field 2K.
W77-05131

BARATARIA BASIN: HYDROLOGIC AND CLIMATOLOGIC PROCESSES,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 2L.
W77-05133

DETERMINATION OF STORM VELOCITIES AS AN AID TO THE QUALITY CONTROL OF RECORDING RAINGAUGE DATA,
Birmingham Univ. (England). Dept. of Civil Engineering.
W. N. A. Hindi, and P. S. Kelway.
Journal of Hydrology, Vol. 32, No. 1/2, p 115-137, January 1977. 13 fig, 4 tab, 6 ref.

Descriptors: *Storm structure, *Rain gages, *Model studies, Quality control, Storms, Rainfall, Precipitation(Atmospheric), Hyetographs, Precipitation gages, Fronts(Atmospheric), Storm water, Time lag.
Identifiers: *Storm velocity, Vetting, Frontal systems, Isochrones.

A technique for studying data from recording rain gauges was described. The method determines a storm velocity and checks the speed of storm features passing recording stations against the speed measured directly from hyetographs. Optimization facilities by which machine processing time can be significantly reduced were discussed. Recording rain gauges suffer from timing errors which can seriously affect the reliability of analyses which rely on short-time data. The pro rata technique of adjustment based on the check-gauge totals is unsatisfactory. The system of studying timing errors produces a list of error levels for relevant station records, which indicate the degree of departure of local event velocity estimates from the general estimate of storm velocity. The list can be used as a guide to rejection, amendment, or acceptance of data, but it is not mandatory. The routine also produces estimates of storm velocity for comparison with wind velocities at various atmospheric levels. By subdividing the data set, local variations of velocity can be deduced. (Roberts-ISWS)
W77-05146

BORON IN COASTAL NORTH FLORIDA RAINFALL,
North Carolina Univ. at Chapel Hill. Marine Sciences Program; and North Carolina Univ. at Chapel Hill. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W77-05152

COMPARATIVE CLIMATIC ANALYSIS OF LOWER MISSISSIPPI RIVER FLOODS: 1927, 1973, AND 1975,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology.
For primary bibliographic entry see Field 2E.
W77-05158

NITROGEN CONTENT AND ACIDITY OF RAIN ON THE GEORGIA COAST,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5A.
W77-05163

EVIDENCE FOR NONSTATIONARITY AS A PHYSICAL EXPLANATION OF THE HURST PHENOMENON,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
K. W. Potter.
Water Resources Research, Vol. 12, No. 5, p 1047-1052, October 1976. 1 fig, 3 tab, 44 ref.

Descriptors: *Model studies, *Climatology, *Statistics, *Precipitation(Atmospheric), Circulation, Persistence, Stochastic processes, Regime, Weather patterns.
Identifiers: *Hurst phenomenon, *Fractional Brownian motion, *Nonstationarity, Climatic regimes, Intransitivity.

Two radically different explanations, or models, of the Hurst phenomenon were contrasted: one explanation attributes the phenomenon to infinite memory in hydrologic processes; the other explanation suggests shifts in the central tendency of hydrologic processes. Both models preserve the Hurst coefficient, but additional empirical evidence was introduced to offer a possible physical framework in terms of nonstationarity for explaining the phenomenon. Long precipitation data from 6 gauge stations were used to detect the nonstationarity of the precipitation. All 6 records evidence a sharp decrease in precipitation at the end of the last century. There is return to higher rainfall after 1940. The Hurst coefficients calculated from the segmented and whole records indicate that the Hurst behavior of the whole records is due to few abrupt shifts in mean. A possible explanation of nonstationarity of the mean is due to 'almost intransitivity' concept, according to which the nonlinearity of the atmosphere-ocean-earth system may result in a number of distinct regimes such that the general circulation tends to persist in a given regime until by chance it acquires a state which allows it to pass into another regime. (Singh-ISWS)
W77-05165

AN EVALUATION OF THE PRACTICALITY AND COMPLEXITY OF SOME RAINFALL AND RUNOFF TIME SERIES MODELS,
Purdue Univ., Lafayette, Ind. School of of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-05179

DERIVATION OF EQUATIONS FOR RAINFALL INFILTRATION,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 2G.
W77-05182

A POINT STOCHASTIC MODEL FOR CONTINENTAL DROUGHTS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
M. L. Kavvas, and J. W. Delleur.
Hydrological Sciences Bulletin, Vol. 21, No. 3, p 407-417, September 1976. 2 fig, 1 tab, 7 ref. OWRT B-036-IND(12).

Descriptors: *Stochastic processes, *Droughts, *Great Lakes, *Central U.S., *Model studies, Thunderstorms, Rainfall, Persistence, Fronts(Atmospheric), Meteorological data, Probability, Equations, Mathematical studies.
Identifiers: *Stochastic model, *Continental droughts, Rainfall occurrences, Meteorological characteristics, Drought lengths.

A two-level point stochastic model was used to represent the daily rainfall occurrences in the midwestern United States. The primary level corresponded to the generating mechanism of the rainfall occurrences such as fronts and thunderstorm clouds. The secondary level corresponded to the actual rainfall occurrences. The persistence of the rainfall occurrences was basically due to the persistence of the rainfall generating mechanisms. The persistence of the actual rainfalls was explained in terms of their clustering around the rainfall generating mechanism. Based on these physical facts, a point stochastic cluster model of the Neyman-Scott type was constructed for the rainfall occurrences around the Great Lakes region of the North American continent. This two-level point stochastic model utilized the meteorological characteristics of the rainfall generating mechanisms for the simulation of the probabilities of dry and wet sequences. The probabilities of drought lengths and the return period of rainfalls were derived from the Neyman-Scott cluster model for practical drought computations. It was shown that the model could very well preserve the marginal probability of drought lengths in the central North American continent. (Roberts-ISWS)
W77-05183

NETWORK DESIGN FOR THE ESTIMATION OF AREAL MEAN OF RAINFALL EVENTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
R. L. Bras, and I. Rodriguez-Iturbe.
Water Resources Research, Vol. 12, No. 6, p 1185-1195, December 1976. 11 fig, 6 tab, 17 ref. OWRT C-4118(No. 9021)(14).

Descriptors: *Design, *Rainfall, *Networks, *Estimating, *Optimization, Areal, Precipitation, Methodology, Sampling, Costs, Stochastic processes, Hydrology, Equations, Computers, Algorithms, Linear programming, Decision making, Systems analysis, Mathematical models.
Identifiers: Cost minimization, Accuracy.

Presented is an efficient network design procedure which is feasible technically and economically. The procedure combines accuracy (accounting for the process and instrument uncertainties) and cost considerations in a way flexible enough to include characteristics and constraints particular to the problem at hand and to the interested designer. This work recognizes rainfall as a multidimensional stochastic process. By using the knowledge of such processing and of multivariate estimation theory, the procedure (optimization) for designing an accurate, least-cost network to obtain the areal mean precipitation of an event over a fixed area is developed. Data collection is viewed as an estimation problem. The methodology allows consideration of the following aspects of network design: (1) spatial uncertainty and correlation of process; 2) errors in measurement techniques and their correlation; and 3) nonhomogeneour sampling costs. Optimal networks are given in terms of the number of location of stations together with the resulting cost and mean square error of rainfall estimation. (Bell-Cornell)
W77-05194

WORKSHOP FOR AN ASSESSMENT OF THE PRESENT AND POTENTIAL ROLE OF

WEATHER MODIFICATION IN AGRICULTURAL PRODUCTION,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W77-05310

RAINFALL NETWORK DESIGN FOR RUNOFF PREDICTION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
R. L. Bras, and I. Rodriguez-Iturbe.
Water Resources Research, Vol. 12, No. 6, p 1197-1208, December 1976. 5 fig, 3 tab, 17 ref.

Descriptors: *Rainfall, *Stochastic processes, *Networks, *Runoff forecasting, Equations, Runoff, Kinetics, Basins, Rainfall-runoff relationships, Flood forecasting, Discharge(Water), Model studies.
Identifiers: *Rainfall network, *Stochastic model, Rainfall generator, Runoff model, Kinematic wave equations, Mean square error, Rain-sampling stations, Rainfall-runoff model.

A multivariate, state-space stochastic model of rainfall based on a multi-dimensional rainfall generator suggested by Bras and Rodriguez-Iturbe was used, together with a runoff model, to study the accuracy of discharge prediction as a function of the rainfall-sampling network. The runoff model used was a spatially distributed simulation based on a finite difference solution of the kinematic wave equations. Discharge prediction accuracy at any point in a basin could be obtained in terms of the mean square error as a function of the number of rain-sampling stations, their location, and the errors in sampling devices. The solution was also a function of the physics of the basin at hand, which was incorporated in the rainfall-runoff model. The mean square error of discharge estimation was obtained by using linear estimation theory for dynamic systems. Particularly, the technique used was the Kalman-Buch filter, which permitted filtering and extrapolation of noisy and incomplete observations. (Roberts-ISWS)
W77-05341

CRITICAL DURATION OF RAINFALL FOR FLOOD ESTIMATION,
Darling Downs Inst. of Advanced Education, Toowoomba (Australia).
W. J. C. Meynink, and I. Cordery.
Water Resources Research, Vol. 12, No. 6, p 1209-1214, December 1976. 8 fig, 3 tab, 17 ref.

Descriptors: *Flood forecasting, *Australia, *Rainfall, Flood data, Design storm, Unit hydrographs, Storms, Watersheds(Basins), Surface runoff, Design flood.
Identifiers: *Flood estimation, *Critical storm duration, Duration of rainfall, Storm characteristics, Dimensionless unit hydrograph.

Many methods of estimating design floods from rainfall data involve a trial and error procedure to determine the duration of the design rainfall. An analytical expression for estimating the appropriate duration for use with a particular unit hydrograph was derived. This analytical expression permitted the effects of other parameters significant to the estimation of the design flood, such as different storm characteristics, to be evaluated with ease. The analytical approach had considerable flexibility in that the mathematical expression linking the hydrograph and rainfall characteristics permitted the independent adjustment of one of the sets of characteristics. This was particularly advantageous where some form of dimensionless unit hydrograph was available for flood estimation. It meant that storm characteristics may be varied from watershed to watershed without any changes being required in the expression for the unit hydrograph. A 'flexible' dimensionless unit hydrograph was also developed. (Roberts-ISWS)
W77-05342

PEAK DISCHARGE FREQUENCY FROM RAINFALL INFORMATION,
Colorado Univ. Denver. Dept. of Civil Engineering.
W. C. Hughes.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY1, Proceedings Paper 12666, p 39-50, January 1977. 5 fig, 6 tab, 6 ref, 2 append.

Descriptors: *Peak discharge, *Depth-area-duration analysis, *Hyetographs, *Statistical methods, *Antecedent precipitation, Hydrology, Agricultural watersheds, Flood forecasting, Runoff, Rainfall-runoff relationships.
Identifiers: *Joint probabilities, Exceedence probability.

A method was formulted for deriving a peak discharge frequency curve using regional rainfall frequencies and historical rainfall information. The method provided a means of obtaining a design discharge with a desired design frequency for small drainage basins where no streamflow data are available. The variables used in the method were rainfall volume, rainfall duration, the temporal distribution of the rainfall and antecendent rainfall where the latter is used as a basin loss coefficient. The method formulated the exceedence probability of a given peak discharge in terms of a finite number of mutually exclusive joint probabilities where each joint probability represents the simultaneous occurrence of given values of the variables normally used in synthetic hydrograph procedures. The methodology was tested on an agricultural watershed, and the results were compared with the historical data. (Singh-ISWS)
W77-05359

CLIMATOLOGICAL AND PHOTOGRAMMETRIC SPECULATIONS ON MASS-BALANCE CHANGES OF MCCALL GLACIER, BROOKS RANGE, ALASKA,
New Brunswick Univ., Fredericton. Dept. of Surveying Engineering.
For primary bibliographic entry see Field 2C.
W77-05426

COMPUTING DERIVATIVES FROM EQUALLY SPACED DATA,
Bell Telephone Labs., Inc., Holmdel, N. J.
C. L. Ruthroff, and W. F. Bodtmann.
Journal of Applied Meteorology, Vol. 15, No. 11, p 1152-1159, November 1976. 11 fig, 5 ref.

Descriptors: *Analytical techniques, *Data processing, *Meteorological data, Rainfall, Rain gages, Fourier analysis, Mathematics, Equations, Frequency analysis, Statistics.
Identifiers: *Analytical errors, Error analysis, Equally spaced data.

The evaluation of derivatives from equally numerical data can lead to very inexact results. This problem arises, for example, in the measurement of 1 min rainfall rates from U.S. Weather Service rain gauge records for use in estimating rain attenuation distributions. In the method of computation of derivatives described here, the data were detrended and transformed into the frequency domain by a finite Fourier series. In the frequency domain, most of the noise can be identified and removed by suitable filtering, and the derivative computed from the inverse transform of the filtered spectrum. The accuracy of the resulting derivative was expressed as a signal-to-noise ratio. Computation of rain rate as the derivative of the trace on a weighing rain gauge chart was included as a practical application of this method. (Sims-ISWS)
W77-05437

THE MEASUREMENT OF 1 MIN RAIN RATES FROM WEIGHING RAINGAGE RECORDINGS,
Bell Telephone Labs., Inc., Holmdel, N.J.
W. F. Bodtmann, and C. L. Ruthroff.
Journal of Applied Meteorology, Vol. 15, No. 11, p 1160-1166, November 1976. 9 fig, 9 ref.

Descriptors: *Precipitation(Atmospheric), *Rainfall intensity, *Frequency curves, *Data processing, Rain gages, Meteorological data, Frequency analysis, Measurement, Meteorology, Climatology, Analytical techniques.
Identifiers: *Analytical errors, Error analysis, Equally spaced data.

A method of obtaining accurate 1 min rain rate distributions from weighing rain gauge records was described. This source of data is of interest because of the large number of weighing rain guage recordings available from the U.S. Weather Service. A special measuring instrument was built, with which data can be read with greater accuracy than can be obtained by direct reading of the chart. Even with this increased accuracy, accurate rain rates cannot be obtained without further processing of the data as described herein. Without this processing, the errors are large, the larger errors occurring at the higher rain rates. The method of data processing employed allows an estimate of the accuracy of the measurements. The method was used to measure 100 years of rainfall data, and the resulting 5-year rain rate distributions for 20 locations in the continental United States was included. (Sims-ISWS)
W77-05438

SEA SURFACE TEMPERATURE RELATED TO RAIN IN CEARA, NORTHEASTERN BRAZIL,
California State Univ., Fresno, Dept. of Geography.
C. G. Markham, and D. R. McLain.
Nature, Vol. 265, No. 5592, p 320-323, January 27, 1977. 2 fig, 7 ref.

Descriptors: *Rainfall, *Forecasting, *Water temperature, *Atlantic Ocean, *South America, Correlation analysis, Oceans, Floods, Foreign countries, Foreign research, Droughts, Arid lands, Climatology, Precipitation(Atmospheric), Meteorology.
Identifiers: *Brazil, *Ceara(Brazil), El Nino, *Sea surface temperature.

Ceara is the node of Brazil's drought-prone northeast. Here, severe drought and its antithesis, flooding, occur about once per decade, arriving without warning. The human misery that follows in their wake might be reduced if they could be forecast. Rainfall in Ceara was correlated with sea surface temperature in the south Atlantic Ocean. Knowledge of sea surface temperature makes possible a useful rainfall forecast before the rainy season begins. The mechanism may be that sea temperature affects the height of the trade wind inversion, and thus the height of the moist layer. The data also suggested an association between below-normal sea temperatures in the south Atlantic and in the El Nino in the Pacific. (Sims-ISWS)
W77-05449

2C. Snow, Ice, and Frost

DETERMINATION OF SNOW DEPTH AND WATER EQUIVALENT BY REMOTE SENSING,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
H. W. Steinhoff, and A. H. Barnes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 229, Price codes: A02 in paper copy, A01 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No 76, June 1976. 13 p, 3 fig, 2 tab. OWRT A-019-COLO(2).

Descriptors: Snow, Measurement, *Remote sensing, Air photography, *Snowmelt, Snow cover, *Water equivalent, *Colorado, Regression analysis.
Identifiers: Durango(Colo), *Snow depth.

The relation of snow depth and elevation on the same aspect (north or south) was definitely linear but the slope of the regression lines varied between months and between years. Thus no uniform prediction was possible of snow depth over an entire watershed from a single measurement at one point. Example: The regression equation for March 4, 1972 on the north aspect was Y SNOW DEPTH(dm) = -24.5 + (1.10 + or - 0.51)X ELEV(100m). Snow depth and water equivalent were consistently related to melt date, sometimes quite strongly. The addition of vegetation density to the equation significantly increased the proportion of variability of snow depth which is accounted for. Little strength was added by including the other environmental factors - aspect, elevation, and slope degree. However, elevation was more strongly related to snow depth early in the spring and aspect was more strongly related later. Prediction of water equivalent was improved by including degree of slope early in the season, and by including aspect and then slope later in the system. An example of multiple regression equation with a multiple R2 of 0.81 is Y SNMAR = -14.0 + 0.081X MELTDA + 0.095X VEGDEN + 0.004X ELEV - 0.021X FROMN - 0.053X SLOPE where subscripts mean SNow depth (dm) in MARch, MELT DAte (year-day), VEGetation DENsity (100 foot-candles), ELEVation (meters), azimuth FROM due North less than 180 (degrees), and degree of SLOPE (percent). Therefore by measuring the melt date and environmental variables one could predict snow depth and water equivalent, once these equations were established for a given area. Melt date can be measured by observation from two aerial flights at three-day intervals.
W77-05104

SNOW ACCUMULATION AS RELATED TO METEOROLOGICAL, TOPOGRAPHIC, AND FOREST VARIABLES IN CENTRAL SIERRA NEVADA, CALIFORNIA,
Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
H. W. Anderson.
Int. Ass. Sci. Hydrology Publ. No 78, p 215-224, 1967. 4 tab, 22 ref.

Descriptors: Regression analysis, *California, Snow, *Snowpacks, *Forest management, Topography, Climates, Energy, Solar radiation.

Snow accumulation at individual points in forest and openings in forests was studied by selecting 16 periods in the winter of 1957-58 under different meteorological conditions. Wide differences in topography and forest conditions were obtained by selection of 250 points from 1,300 available. Snow accumulation was the difference in water equivalent of the snow pack between measurements. Meteorological variables included functions of clouds, wind, humidity, temperature, and precipitation. Forest variables included indexes of shade, back radiation, interception, cold air drainage, and shelter from the wind. Topography was expressed in terms of solar energy received and exposure to prevailing winds. The factors related to snow accumulation were studied by reduced rank procedure of principal components, principal axis, canonical, and alpha factoring with varimax rotation of the factors. The best regressions relating the variables to snow accumulations arose from principal components analysis when highly correlated variables were included. Snow accumulation depended strongly on combinations of meteorological and forest variables, and on forest-meteorological interactions. Interception of snow, as indexed by the canopy over the point, averaged 10 per cent of the precipitation. Snow accumulation in forest openings, forest margins, and in large areas of uniform forest had different relations to meteorological and topographic variables. Forest shade and back radiation from trees were most important on high energy south slopes. (Forest Service)
W77-05113

SUPPRESSION OF EVAPORATION LOSSES FROM SNOWPACKS,
Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
For primary bibliographic entry see Field 3B.
W77-05123

LAKE ONTARIO ICE MODELING IFYGL, PHASE 3, FINAL REPORT,
General Electric Co., Philadelphia, Pa. Re-Entry and Environmental Systems Div.
J. F. Dilley.
Final Report No. 76SDR2209 to NOAA Great Lakes Environmental Research Laboratory, June 1976. 77 p, 31 fig, 3 tab, 13 ref, 2 append. NOAA 03-5-022-45.

Descriptors: Great Lakes, *Lake Ontario, *Ice cover, Heat transfer, Evaporation, *Mathematical models, *Lake ice, Heat balance, Simulation analysis.
Identifiers: *Ice thickness.

Ice formation, growth, and decay on Lake Ontario is simulated on two scales: a small, local, near shore scale and a whole lake scale. A previously developed and recently improved two dimensional, time dependent, near shore ice model is used to simulate the ice episodes during the IFYGL winter (1972-73). Each surface heat transfer mode is separately computed so that the effect on the ice cover can be quantitively evaluated. The convective flux dominated the heat loss during the freezing periods and it was usually twice as large as the evaporative loss. The solar flux usually dominated the heat gain during the melting periods. The computed ice thicknesses compared very well with the closest available ice thickness data. On the whole lake scale, a locally one dimensional form of the model was used to compute the various heat transfers including latent heat as a function of depth at four stations with individual meteorological and radiation inputs. The model generated realistic ice distributions when compared with ice charts and satellite images. Based on the overall good performance of the model, it is felt that it is suitable for additional ice modeling applications. (NOAA)
W77-05128

ICE GROWTH IN DULUTH-SUPERIOR HARBOR,
Minnesota Univ., Duluth. Dept. of Physics.
G. Oman, D. Smith, and M. Sydor.
Report to NOAA Great Lakes Environmental Research Laboratory, 1976. 21 p, 10 fig, 7 ref. NOAA 04-5-022-13.

Descriptors: *Albedo, *Ice cover, *Heat balance, *Thermal pollution, Harbors, Mathematical models, Heat budget, *Minnesota, Lake Superior, Great Lakes.
Identifiers: *Duluth-Superior Harbor(Minn).

Terms entering the heat budget balance for the Duluth-Superior Harbor were obtained from measurements and weather data. The ice growth follows the net radiation in the harbor with the exception of the high turbulence area in combination with thermal effluents where the heat transport in water becomes significant and gives rise to large sections of the harbor showing 20-50% decrease in ice thickness depending on the flow velocities and the proximity of effluent sources. The dependence of ice growth on the albedo and the turbulent heat transport was considered to determine the influence of particulate and thermal pollution on the heat budget. The variations in these terms account for most of the differences in ice thickness observed in the harbor. LANDSAT data were used for determination of the relative distribution in albedo, while the turbulent flux was obtained from temperature distribution measurements and water flow rates which were calculated from a numerical model. (NOAA)
W77-05129

MATHEMATICAL MODELS OF A MELTING SNOWPACK AT AN INDEX PLOT,
Universite Scientifique et Medical de Grenoble (France). Institut de Mechanique; and Universite Scientifique et Medicale de Grenoble (France). Groupe d'Hydrologie.
Ch. Obled, and B. Rosse.
Journal of Hydrology, Vol. 32, No. 1/2, p 139-163, January 1977. 9 fig, 1 tab, 19 ref.

Descriptors: *Snowpacks, *Melting, *Snowmelt, *Model studies, *Mathematical models, Lysimeters, Melt water, Runoff, Watersheds(Basins), Mountains, Forests, Forest watersheds, Snow, Foreign countries, Foreign research, Solar radiation, Interfaces, Energy budget, Temperature, Water resources.
Identifiers: *French Alps.

A detailed model, based on present knowledge on snowmelt processes, was first developed. This model was calibrated and tested with the data of two lysimeter sites located in the north French Alps, one in an open area and one in a forested area. The assumption required were discussed extensively and were sustained by further measurements, particularly the surface temperature, computed by an iterative technique, which is the key variable of the energy budget at the air-snow interface. Using a 3-h time step, this model appeared to be very satisfactory in simulating meltwater outflows during the whole melt period. In addition, the cmputation, on a continuous basis, of the temperature profile and cold content of the snowpack proved to be sufficiently accurate and very useful for hydrological purposes such as determining the beginning of outflows after cold spells. In order for the model to be fitted to the data usually available in mountainous regions, the model structure was then altered slightly, and the missing data were replaced by various estimates. The effects on the accuracy of prediction were briefly considered. It appears that a subroutine with a time step of 12 h is sufficiently accurate for the majority of watershed model requirements. Such a subroutine, which can easily be integrated in a complete watershed model, was finally presented. (Sims-ISWS)
W77-05147

SUMMER MOISTURE-TEMPERATURE FOR ARCTIC TUNDRA,
California Univ., Irvine, Dept. of Civil and Environmental Engineering.
G. L. Guymon.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 102, No. IR4, Proceedings Paper 12613, p 403-411, December 1976. 5 fig, 5 ref, 1 append. OWRT C-4049(No. 9010)(4).

Descriptors: *Alaska, *Drainage, *Arctic, Hydrology, Permafrost, Pore water, Pore pressure, Temperature, Water, Hydraulic gradient, Seasonal, Summer, *Soil moisture, Moisture content, *Soil temperature.
Identifiers: *Pore water pressure, *Arctic Tundra, Internal soil profile, Topographic drainage conditions, Soil moisture regime, Permafrost table, Summer moisture-temperature.

Measurements of soil moisture and temperature were made during the summer of 1973 in an Arctic tundra region underlain by shallow ice-rich permafrost. Three sites near Barrow, Alaska, were studied which represented a range of internal soil profile and topographic drainage conditions. Tundra soils exhibited different soil moisture regimes depending upon drainage conditions. Poorly drained soils may have been waterlogged and much cooler than well-drained soils which were unsaturated. During the spring, high pore water pressure existed just below the frozen layer, and, consequently, a steep downward hydraulic gradient existed. During the summer, the soil moisture regime was less dynamic than other times of the year. A water table was developed in the

poorly drained soils studied. During the fall, the soil froze from the surface and the permafrost table which caused a region of low pore water pressure to develop near the center of the active layer. The poorly drained saturated soils were rapidly dried during the fall. (Roberts-ISWS)
W77-05185

A NORTHERN SNOWMELT-FLOOD FREQUENCY MODEL,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2E.
W77-05186

A STOCHASTIC POINT-PROCESS MODEL FOR THE OCCURRENCE OF MAJOR FREEZES IN LAKE CONSTANCE,
Byk Gulden Research Centre, Konstanz (West Germany).
V. W. Steinijans.
Applied Statistics, Journal of the Royal Statistical Society, Vol 25, No 1, p 58-61, 1976. 1 fig, 1 tab, 7 ref.

Descriptors: *Lakes, *Freezing, *Meteorology, *Stochastic processes, Estimating, Methodology, Mathematical models, Systems analysis.
Identifiers: Non-stationary poisson process, Rate function, *Lake Constance, Austria, Germany, Switzerland.

A stochastic point process model is proposed to describe the occurrence of major freezes in Lake Constance, Europe's third largest lake, bordered by Austria, Germany and Switzerland. Using existing methodology, it is shown that a non-stationary Poisson process with exponential polynomial rate function of degree two provides a reasonable fit to data on 38 major freezes in Lake Constance over the period A.D. 875 to A.D. 1974. (Bell-Cornell)
W77-05242

A COMPUTER-AIDED SNOWMELT MODEL FOR AUGMENTING WINTER STREAMFLOW SIMULATION IN A SOUTHERN ONTARIO DRAINAGE BASIN,
Ontario Ministry of the Environment, Toronto (Ontario). Water Resources Branch.
L. A. Logan.
Canadian Journal of Civil Engineering, Vol. 3, No. 4, p 531-554, December 1976. 16 fig, 4 tab, 11 ref.

Descriptors: *Simulation analysis, *Computer models, *Snowmelt, *Drainage, *Basins, Snowpacks, Winter, Streamflow, Monitoring, Hydrology, Meteorological data, Flood flow, Spring, Runoff, Storage, Estimating, Equations, Algorithms, Systems analysis, *Canada.
Identifiers: *Ontario(Canada), Snow accumulation.

A lumped-parameter mathematical model is formulated to represent the physical processes of the accumulating and melting snowpack within a drainage basin. Common theoretical descriptions of the processes represent snow accumulation and melt at a point, but computer-aided procedures facilitate spatial distribution of the model inputs and thus provide for a digital simulation of the basin-wide snowpack condition and melt with time. The model is treated on the basis of the energy flux and mass transfer processes relating to the average snowpack, across the snowpack-atmosphere and snowpack-ground surface interfaces. An awareness of the probable lack of the extensive meteorological data usually required for proper application of such models necessitates reliance on a number of literature-cited and locally-derived empirical snowmelt relationships in order to insure a practical and viable model. Thus, auxiliary computer subroutines are formulated to provide for applicable options, depending on the availability of real-time data. The purpose of the snowmelt model is to serve as a monitor of net basin input, complementing an overall comprehensive integrated hydrologic system model for use in streamflow simulation. The model is calibrated and tested with real-time data in a Ministry of the Environment-IHD Representative Drainage Basin in southern Ontario. Its applicability in estimating maximum flood flows during spring runoff periods is demonstrated by imposing meteorological conditions favorable for continuous melting upon maximum snowpack storage conditions. (Bell-Cornell)
W77-05247

A STOCHASTIC APPROACH TO SNOWMELT RUNOFF FORECASTING,
Minnesota Univ., St. Paul; and Minnesota Univ., Minneapolis.
K. Kim.
Available from University Microfilms, Inc., Ann Arbor, Michigan, Order No. 76-27,863. Ph.D. Thesis, 1976, 153 p.

Descriptors: *Model studies, *Hydraulic models, *Runoff forecasting, *Snowmelt, Temperature, Simulation analysis, Stochastic processes, Markov processes, Streamflow forecasting, Precipitation(Atmospheric).
Identifiers: Minnesota River Basin(Minn), Streamflow Synthesis and Reservoir Regulation(SSARR) model, Precipitation data.

A study was undertaken to develop models using air temperature and precipitation data to determine the range and probability of snowmelt floods during spring periods. The Minnesota River Basin was used to develop stochastic simulation models. The transformation function chosen was the Streamflow Synthesis and Reservoir Regulation (SSARR) model. Temperature at one station could be modeled. It was transformed to determine constant variance, then divided into deterministic and stochastic components. The first was represented by a second degree regression line and the latter was shown as a first order autoregressive, first order moving average model. With a network of stations, air temperature was modeled like that for a single station except for the modeling of white noise. Transformation coefficients were obtained at all stations to determine transformation temperature. Deterministic and stochastic portions were represented by a second order regression line and an ARMA model for each station. Precipitation for a single station was represented by a first order Markov chain model and a gamma distribution with the proper parameter values. Wet day precipitation at each station was independently described by gamma distribution since the amounts of precipitation at all study stations was assumed to be independent. A 500-year data sequence was generated by the proposed models for each station. This data was divided into four groups by possible contribution to snowmelt runoff. One temperature of precipitation sequence was input to the SSARR model from each group for simulation of floods. Major and minor floods, similar to past floods, were generated. (Collins-FIRL)
W77-05323

A CHARACTERIZATION OF URBAN STORM-WATER RUNOFF IN BOULDER, COLORADO,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-05369

POLLUTIONAL CHARACTERISTICS OF URBAN SNOWMELT RUNOFF,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-05370

DEUTERIUM, TRITIUM AND GROSS-BETA-ACTIVITY INVESTIGATIONS ON ALPINE GLACIERS (OTZTAL ALPS),
Innsbruck Univ. (Austria). Physikalisches Institut.
W. Ambach, H. Eisner, M. Elsasser, U. Loschhorn, and H. Moser.
Journal of Glaciology, Vol. 17, No. 77, p 383-400, 1976. 14 fig, 4 tab, 21 ref.

Descriptors: *Glaciology, *Alpine, *Discharge(Water), *Melt water, *Glaciers, Foreign countries, On-site investigations, Evaluation, Runoff, Snowmelt, Dating, Tracers, *Tritium, Radioactive dating, Sampling, Snow, Ice, *Deuterium, Firn, Cores, Data collections, Hydrologic data, Variability, Radioactivity.
Identifiers: *Austria, *Otztal Alps(Austria), Glacial catchments.

By measuring the deuterium contents of stream water, spring water, and melt water, as well as ice and snow samples, the mean contributions to melt water in the runoff from Hintereisferner were estimated, that of melt water being 60% and that of spring water being 40%, in months of July to September. Spring water is characterized by very low deuterium contents, whereas ice-melt water and snow-melt water in the summer were found to have about the same rather high deuterium content. The deuterium content in the runoff was subjected to considerable seasonal fluctuations owing to the changing shares in melt water and spring water. The deuterium contents in individual glacier runoffs showed similar seasonal fluctuations and were furthermore characterized by a parallel shift of the deuterium concentrations, because of the different altitudes of catchment areas. Differences in the mean altitudes of catchment areas were estimated for the winter and summer discharges on the basis of the isotope altitude effect. The seasonal fluctuations of the tritium contents in glacier discharges are caused mainly by the melt water from glacier ice, which contains practically no tritium. Minimum values of tritium content in the runoff were found during the period of maximum ice ablation. The mean residence time of the base-flow in the groundwater system of a catchment area was estimated to be a few years because of the tritium content in the winter runoff and in the precipitations of past years. Profiles of the gross beta activity in firn cores, clearly show activity peaks in summer horizons that are suitable for net accumulation analyses. A characteristic peak in the profile of the tritium content which may be attributed to the net accumulation of 1962/63 is well suited for use as a reference horizon. (Humphreys-ISWS)
W77-05420

MATHEMATICAL MODEL OF A THREE-DIMENSIONAL NON-ISOTHERMAL GLACIER,
Moscow State Univ. (USSR). Institut Mekhaniki.
S. S. Grigoryan, M. S. Krass, and P. A. Shumskiy.
Journal of Glaciology, Vol. 17, No. 77, p 401-417, 1976. 3 fig, 3 ref.

Descriptors: *Glaciers, *Mathematical models, *Theoretical analysis, *Ice, Movement, Mathematical studies, Analytical techniques, Thermodynamics, Heat transfer, Velocity, Temperature, Equations, Rheology, Mechanical properties.
Identifiers: *Non-isothermal glaciers, *Cold glaciers, Land glaciers.

A mathematical model was constructed for land glaciers with the thickness much less than the horizontal dimensions and radii of curvature of large bottom irregularities by means of the method of a thin boundary layer in dimensionless orthogonal coordinates. The dynamics were described by a statically determinate system of equations, so the solution for stresses was found. For the general non-isothermal case, the interrelated velocity and temperature distributions were calculated by means of the iteration of solutions for velocity and for temperature. Temperature distribution was determined by a parabolic equation

with a small parameter at the senior derivative. Its solution was reduced to the solution of a system of recurrent nonuniform differential equations of the first order by means of a series expansion of the small parameter. A relatively thin conducting boundary layer adjoins the upper and lower surfaces of a glacier, playing the role of a temperature damper in the ablation area. For ice divides, the statistically indeterminate problem was solved, so the result for stresses depended on the temperature distribution. (Humphreys-ISWS)
W77-05421

MATHEMATICAL MODELS OF ICE SHELVES,
Moscow State Univ. (USSR). Institut Mekhaniki.
P. A. Shumskiy, and M. S. Krass.
Journal of Glaciology, Vol. 17, No. 77, p 419-432, 1976. 5 fig, 6 ref.

Descriptors: *Mathematical models, *Glaciers, *Ice, *Theoretical analysis, Equations, Rheology, Floating, Heat transfer, Movement, Velocity, Temperature, Mathematical studies, Analytical techniques, Mechanical properties.
Identifiers: *Ice shelves, Thermal stability.

For flat external ice shelves, expanding freely in all directions, the problem of thermodynamics is one-dimensional. In the affine dimensionless system of coordinates, equations of the dynamics together with the rheological equation lead to the non-linear, integro-differential equation involving the reduced temperature. In the quasi-steady case, the boundary problem for this equation was solved by means of the method of combining asymptotic expansions. It was shown that if ice is coming from the upper and lower surfaces in the opposite directions, the regime is unsteady because of the internal heat accumulation. The integro-differential equation for the temperature in the case of thinning internal ice shelves is more complicated, but it can be solved by a method analogous to the one mentioned above. (Humphreys-ISWS)
W77-05422

TEMPERATURE-GRADIENT INDUCED MASS-INSTABILITY THEORY OF GLACIER SURGE,
Simon Fraser Univ., Burnaby (British Columbia). Faculty of Science.
E. M. Shoemaker.
Journal of Glaciology, Vol. 17, No. 77, p 433-445, 1976. 4 fig, 4 tab, 17 ref.

Descriptors: *Glaciers, *Ice, *Surges, *Mathematical models, Stability, Theoretical analysis, Temperature, Thermocline, Analytical techniques, Model studies, Movement, Velocity, Equations, Mathematical studies, Melting, Mechanical properties, Numerical analysis, Ablation, Data collections.
Identifiers: *Glacier surge, Surge cycle time, Cold glaciers.

A theory was proposed that glacier surges are the result of a time-independent but positionally-dependent temperature distribution in which the mean effective temperature increases downslope. The theory was modeled by a slab analogy in which plane motion on a plane slope consists of uniform shear in a sub-region called the reservoir region. Assuming the usual power function relationship between stress and strain-rate, a thickening of the glacier in excess of its constant-state condition tends to induce instability; i.e., as the reservoir region thickens, the oscillation of the region (up and down the slope) becomes unstable. Assuming an accumulation rate which increases linearly with elevation, this oscillation was represented by a nonlinear ordinary differential equation. Numerical results were considered, and reasonable assumptions, where data does not exist, render surge cycle times into close agreement with observation. The theory does not require basal sliding, but this can be included. (Humphreys-ISWS)
W77-05423

GLACIER SLIDING DOWN AN INCLINED WAVY BED,
University of East Anglia, Norwich (England). School of Mathematics and Physics.
L. W. Morland.
Journal of Glaciology, Vol. 17, No. 77, p 447-462, 1976. 3 fig, 11 ref.

Descriptors: *Glaciers, *Ice, *Mathematical models, Movement, Theoretical analysis, Analytical techniques, Flow, Viscous flow, Heat transfer, Creep, Velocity, Mathematical studies, Drag, Interfaces, Beds, Profiles, Velocity.
Identifiers: *Glacier sliding, Wavy bed, Basal sliding.

The treatments by Nye and Kamb of glacier sliding over a wavy bed with small slope, which assume the ice to be approximated by a Newtonian fluid of high viscosity, were complemented by the inclusion of the glacier depth and the inclination of the bed to the horizontal. The driving force of the motion, gravity, is therefore present in the flow equations and immediately defines the mean drag on the bed. A geothermal heat flux was also included in order to estimate its possible effect on the flow. It was shown that a uniform geothermal flux does not influence the basal-sliding velocity and makes only a small contribution to the flow field. A complex variable method was used to determine the velocity and temperature fields to second order in the bed slope. These fields satisfy the zero shear traction and pressure-melting-regelation conditions to the same order on the actual bed profile. It is the balance of the second-order term which determines explicitly the (zero order) basal-sliding velocity and surface velocity in terms of the geometry and physical properties of both ice and bed. An explicit solution was illustrated for a sinusoidal bed, and a simple criterion for the onset of cavitation was obtained. (Humphreys-ISWS)
W77-05424

GLACIER SLIDING DOWN AN INCLINED WAVY BED WITH FRICTION,
University of East Anglia, Norwich (England). School of Mathematics and Physics.
L. W. Morland.
Journal of Glaciology, Vol. 17, No. 77, p 463-477, 1976. 4 fig, 12 ref.

Descriptors: *Glaciers, *Ice, *Mathematical models, Movement, Theoretical analysis, Analytical techniques, Flow, Viscous flow, Creep, Velocity, Mathematical studies, Drag, Interfaces, Beds, Profiles, Friction, Temperate, Traction.
Identifiers: *Glacier sliding, Wavy bed, Basal sliding.

The effects of frictional tangential traction combined with regelation on the basal sliding of a temperate glacier down an inclined wavy bed were examined. Two friction models were treated. First treated was a Coulomb law model, which assumed that sliding occurs everywhere and that the tangential traction is proportional to the normal pressure. Secondly, a velocity power law model was treated in which the tangential traction is proportional to a power of the slip velocity. The ice motion was approximated by steady, slow Newtonian flow, and the bed undulation about a mean bedline has a maximum slope, epsilon is much less than 1. Flow solutions were constructed as perturbations (in powers of epsilon) of the plane laminar flow corresponding to non-slip on the mean bedline, assuming that the ice remains everywhere in contact with the bed; that is, no cavitation takes place. If the normal traction is predicted to be tensile over part of the bed, implying that cavitation has occurred, then a new solution is needed in which the ice base over cavities is traction-free. Since the cavity sections and profile of the free ice base are then part of the overall solution, an intricate, mixed boundary-value problem is set up for the flow, and the present analysis is inadequate. For sinusoidal bed, the perfect-slip (zero tangential traction) solution predicts compressive normal traction everywhere on the bed, provided that the mean bed-line inclination (to the horizontal) is less than a critical value which is of order epsilon. For greater values of bed inclination, including a range of order epsilon, the normal traction is tensile on some parts of the bed, and a solution with cavitation is needed. If the tensile sections are relatively small, it is expected that the resulting cavitation will not change the overall solution significantly. The predicted basal sliding velocity varies much less with the length scale of the bed undulation than in the perfect-slip solution, and is smaller. (Humphreys-ISWS)
W77-05425

CLIMATOLOGICAL AND PHOTOGRAMMETRIC SPECULATIONS ON MASS-BALANCE CHANGES OF MCCALL GLACIER, BROOKS RANGE, ALASKA,
New Brunswick Univ., Fredericton. Dept. of Surveying Engineering.
E. Dorrer, and G. Wendler.
Journal of Glaciology, Vol. 17, No. 77, p 479-490, 1976. 8 fig, 2 tab, 40 ref. NSF GA-37306, DES 75-06184

Descriptors: *Glaciers, *Ice, *Alaska, *Surveys, Analytical techniques, *Climatology, Data processing, Evaluation, *Photogrammetry, Analysis, Measurement, On-site investigations, Movement, Aerial photography, Terrain analysis.
Identifiers: *McCall Glacier(Alaska), *Mass balance changes.

The mean mass balance of the McCall Glacier, Brooks Range, Alaska, was estimated for the period 1958-1971. The three methods used, photogrammetry, mean height of the equilibrium line, and correlation with the height of the synoptic 500 mbar pressure level, gave negative values, but the amount depended on the method used. This trend of glacier recession is in agreement with most observations of glaciers in the Brooks Range as well as with the majority of the glaciers in the Northern Hemisphere. (Humphreys-ISWS)
W77-05426

A STUDY OF GLACIER-DAMMED LAKES OVER 75 YEARS, BRIMKJELEN, SOUTHERN NORWAY,
Portsmouth Polytechnic (England). Dept. of Geography.
For primary bibliographic entry see Field 2H.
W77-05427

PHASE RELATIONSHIPS IN SEA ICE AS A FUNCTION OF TEMPERATURE,
Naval Undersea Center, San Diego, Calif.
C. Richardson.
Journal of Glaciology, Vol. 17, No. 77, p 507-519, 1976. 8 fig, 2 tab, 12 ref.

Descriptors: *Sea ice, *Water chemistry, *Freezing, *Laboratory tests, Saline water, Sea water, Salts, Chemical precipitation, Ice, Instrumentation, Spectrometers, *Temperature, Solvation, Phase diagrams, Evaluation, Basic data collections, Hydrate processes, Sodium sulfate, Sodium chloride, Calcium carbonate, Calcium chloride, Magnesium chloride, Potassium chloride.
Identifiers: *Binary salts, Eutectic temperature.

Quantitative measurements of the liquid water phase in a sample of sea ice were made with a nuclear magnetic resonance (n.m.r.) spectrometer. The measurements were used to compute the phase relationships in sea ice as a function of temperature. A model for seawater based upon a mixture of seven binary salts was used for these computations. The n.m.r. measurements are related to the solvation water, which is associated with each binary salt. This solvation water is bound to the salt in a pseudo-crystalline structure, with the

amount of water determined by the eutectic concentration of the salt. The results were given in tabular form and differ somewhat from previously published tables. Two controversial hydrated salts were added to the table, based on the n.m.r. data. (Humphreys-ISWS)
W77-05428

SEISMIC SIGNALS ASSOCIATED WITH AVALANCHES,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
W. St. Lawrence, and T. R. Williams.
Journal of Glaciology, Vol. 17, No. 77, p 521-526, 1977. 4 fig, 1 ref. DA-ARO-D-31-124-71-G59, NSF GA-3943.

Descriptors: *Avalanches, *Snowpacks, *Monitoring, *Montana, *Seismic studies, Snow, Movement, On-site investigations, Surveys, Instrumentation, Seismographs.
Identifiers: *Bridger Range(Mont).

A seismic survey was conducted during the winter of 1974-75 to determine the extent to which signals from avalanches can be detected using standard seismic techniques. The results of this investigation showed that signals associated with avalanching snowpacks have characteristics patterns which differentiate them from signals of extraneous origin. This result indicates that seismic monitoring of a major slide path may be a valuable aid to avalanche forecasting, especially as it relates to forecasting delayed-action avalanches where strong reliance on meteorologic variables may not be sufficient to develop an accurate forecast. This method also provides a reliable technique for making observations in the starting zones of major slide paths where it may not be practical to make site visitations. (Humphreys-ISWS)
W77-05429

RADIO-ECHO POWER PROFILING,
Scott Polar Research Inst., Cambridge (England).
C. S. Neal.
Journal of Glaciology, Vol. 17, No. 77, p 527-530, 1976. 1 fig, 4 ref.

Descriptors: *Sounding, *Glaciers, *Instrumentation, *Ice, Surveys, Profiles, Depth, Exploration, Boundaries(Surfaces), Surfaces, Interfaces, Ice-water interfaces, Radio waves, Frequency, Surveys, Reflectance.
Identifiers: *Radio-echo, Ice-rock interfaces.

A method of continuously recording the r.f. power returned from a subglacial ice/rock or ice/water interface was described. Illustrations of the records produced were given, and their relevance to the reconstruction of the small scale roughness of a reflecting surface was discussed. The continuous power profiles are expecially useful for: (1) locating regions of similar bottom roughness characteristics; (2) following the changing nature of the ice/rock or ice/water interface along a flow line; and (3) detecting changes in either the reflection coefficient of the ice/rock interface or the r.f. absorption properties of the ice. (Humphreys-ISWS)
W77-05430

A STOCHASTIC SNOW MODEL,
Arizona Univ., Tucson. Dept. of Watershed Management.
L. E. Cary.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 745, Price codes: A07 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1974. 135 p, 22 fig, 9 tab, 65 ref, 2 append. OWRT B-032-ARIZ(13). 14-31-0001-3858.

Descriptors: Precipitation(Atmospheric), *Mathematical models, Stochastic processes, Snow, Water supply, Model studies, *Snowfall, *Ablation, Storms, Poisson ratio, *Snowpacks.
Identifiers: *Snow accumulation, Snow storms.

The purpose was to develop a stochastic model of the snowfall, snow accumulation and ablation process. Snow storms occurring in a fixed interval were assumed to be a homogeneous Poisson process. The snow storm magnitudes were assumed to be independent, identically distributed random variables, and independent of the number of storms. The snow water equivalent from all storms was a compound Poisson process. In the model, storms occurred as positive jumps whose magnitudes equaled the storm amounts. Between storms, the snowpack ablated at a constant rate and lasted for a random duration. The snow-free periods were independent and identically distributed random variables as were the snowpack durations. The sum of each snow-free period and the immediately following snowpack duration formed another sequence of independent and identically distributed random variables, the snow-free, snow cycles which were modeled as a renewal process. Distribution functions of the random variables were derived, with the snow-free periods being exponentially distributed and the snowpack durations obtained by using results from queueing theory. Specific expressions for the distribution functions of the random variables were obtained as functions of the mean arrival rate for storms, the mean depth of snowfall per storm, and the snowpack ablation rate. The snow model was compared with data from the climatological station at Flagstaff, Arizona, with the results being sufficiently acceptable to warrant continued research.
W77-05489

2D. Evaporation and Transpiration

SUPPRESSION OF EVAPORATION LOSSES FROM SNOWPACKS,
Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
For primary bibliographic entry see Field 3B.
W77-05123

MODEL TO EVALUATE FEEDLOT RUNOFF CONTROL SYSTEMS,
Kansas State Univ., Manhattan. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-05238

EVAPORATION REDUCTION FROM SOIL WITH WHEAT, SORGHUM, AND COTTON RESIDUES,
Southwestern Great Plains Research Center, Bushland, Tex.
P. W. Unger, and J. J. Parker.
Soil Science Society of America Journal, Vol. 40, No. 6, p 938-942, November-December 1976. 5 fig, 2 tab, 20 ref.

Descriptors: *Water management(Applied), *Soil water, *Evaporation, *Evapotranspiration, Soils, Wheat, Sorghum, Cotton, Grain sorghum, Mulching, Great Plains.
Identifiers: *Residue management, *Soil water storage, *Southern Great Plains, Soil water conservation, Soil water evaporation.

Wheat, grain sorghum, and cotton were major irrigated crops on the Southern Great Plains. While irrigated wheat residue mulches increase soil water storage and decrease evaporation, very limited data were available regarding the effectiveness of grain sorghum and cotton (stalk) residues for the same results. This study was conducted to compare the effectiveness of wheat, grain sorghum, and cotton residues for decreasing evaporation under three potential evaporation conditions and to determine which residue characteristics were most effective for decreasing evaporation. Laboratory tests were conducted on Pullman clay loam soil columns at potential evaporation rates of 0.66, 0.92, and 1.29 cm/day. Besides a bare soil (check) treatment, residue treatments were 4, 8, 16, and 32 meteric tons/ha for sorghum and cotton, and 8 metric tons/ha for wheat. About 16 metric tons/ha of sorghum and more than 32 tons/ha of cotton residues were needed to decrease evaporation to levels obtained with 8 tons/ha of wheat residue. Multiple regression analysis indicated that residue thickness most strongly affects cumulative evaporation and evaporation rates at selected days of the study. Other independent variables considered were: potential evaporation, relative humidity, residue specific gravity, application rate, and surface coverage. (Roberts-ISWS)
W77-05435

CALCULATING EVAPORATION FROM NATIVE GRASSLAND WATERSHEDS,
Agricultural Research Service, Temple, Tex.
J. T. Ritchie, E. D. Rhoades, and C. W. Richardson.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 6, p 1098-1103, November-December 1976. 5 fig, 1 tab, 17 ref.

Descriptors: *Evaporation, *Grasslands, *Evapotranspiration, *Model studies, Mathematical models, Vegetation, Computer models, Vegetation effects, Transpiration, Soils, Soil water, Moisture content, Root zone, Radiation, Solar radiation, Temperature, Rainfall, Precipitation(Atmospheric), Watersheds(Basins), Runoff, Drainage.

Evaporation from soil and plant surfaces in many natural grassland sites will often be less than potential evaporation because of sparse vegetation or soil water deficits in the root zone. A computer model developed for calculating daily evaporation from row crop surfaces with partial cover was modified for use on native grasslands. Daily evaporation was computed by adding independently calculated soil evaporation and transpiration. Potential evaporation was calculated from commonly available atmospheric information. Soil evaporation rate was related to soil hydraulic properties, mulch cover, and potential evaporation rate. Transpiration rate was related to potential evaporation through the green leaf area index and the soil water status of the root zone. Daily evaporation was calculated for three small native grassland watersheds where runoff, rainfall, and soil water content were measured. Seasonal changes in soil water content were calculated based on drainage rates computed from the amount of infiltration in excess of the upper limit of extractable soil water and calculated evaporation rates. Calculated changes were usually within + or - 5 cm of measured soil water during a 1-yr period. (Sims-ISWS)
W77-05442

2E. Streamflow and Runoff

HYDROGRAPH ANALYSIS: A COMPUTERIZED SEPARATION TECHNIQUE,
Intermountain Forest and Range Experiment Station, Moscow, Idaho.
For primary bibliographic entry see Field 4A.
W77-05117

A NONLINEAR KINEMATIC WAVE MODEL FOR WATERSHED SURFACE RUNOFF,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh, and D. A. Woolhiser.
Journal of Hydrology, Vol. 31, No. 3/4, p 221-243, December 1976. 5 fig, 4 tab, 21 ref, 2 append.

Descriptors: *Model studies, *Hydrographs, *Topography, *Infiltration, *Optimization, Agriculural watersheds, Surface runoff, Momen-

tum equation, Peak discharge, Hydrology, Terracing.
Identifiers: *Kinematic wave model, *Nash model, Geometric parameters.

The kinematic flow on a converging surface was considered as a simple, nonlinear model to describe watershed surface runoff. The converging overland flow model has three parameters: two geometric parameters and one kinematic wave friction relationship parameter. The geometric parameters were determined from watershed topography. The procedure for transforming the complex geometry of a natural watershed into an equivalent converging-section geometry was outlined. The kinematic wave relationship parameter was obtained by an optimization procedure. The developed nonlinear kinematic wave model was tested on several natural agricultural watersheds located in two geographically distinct regions. Both the proposed and the Nash models performed well in predicting hydrograph peaks for the storms over the study watersheds, but time and shape characteristics were represented better by the proposed model. (Singh - ISWS)
W77-05140

AN EXAMINATION OF THE VARIANCE MINIMIZATION TENDENCIES OF A SUPRAGLACIAL STREAM,
California Univ., Santa Barbara. Dept. of Geography.
J. Dozier.
Journal of Hydrology, Vol. 31, No. 3/4, p 359-380, December 1976. 12 fig, 1 tab, 34 ref. ARO DAHCO4 67 C 0047.

Descriptors: *Fluvial sediments, *Glaciers, *Streams, Geomorphology, Hydraulics, Sediment transport, Channels, Erosion, Graphical analysis, Mathematical models, Equations.
Identifiers: *Supraglacial streams, Variance minimization, Landscape evolution, Erodible channels, Bed shear stress, Skin resistance, Spectral analysis, Cross-spectral analysis.

Synthesis of landscape evolution based upon the actual processes of transfer of energy and material is difficult because the hydraulics of erodible channels is not fully understood. Previous workers have utilized variance minimization postulates to derive certain hydraulic relations, but these have been unsatisfactory because of the lack of a mechanism for variance minimization. This study examined the validity of the variance-minimization principle through an investigation of the changes in the longitudinal distribution of the bed-shear-stress components over a two-month period in two reaches, one meandering and one straight, of a rapidly eroding supraglacial stream. During this time, the coefficients of variation of bed shear stress, skin resistance, and form resistance decreased in both reaches. Except for skin resistance, the values were lower for the curved reach than for the straight. Spectral analysis of the paths of the reaches and of the stress distributions indicated that the scale of the regularities decreasing discharge. Cross-spectral analysis of the shear-stress components on different dates indicated that in the curved reach, the locations of the minimum shear stresses at the end of the summer coincide with the locations of the maximum skin resistances at the beginning of the summer. (Lee - ISWS)
W77-05141

A NOTE ON THE SYNCHRONISM OF HIGHLY CORRELATED LAKES,
Consiglio Nazionale delle Ricerche, Milan (Italy). Centro di Teoria dei Sistemi.
For primary bibliographic entry see Field 2H.
W77-05142

STOCHASTIC MODELLING OF THE EFFECTS OF RESERVOIR OPERATION,
Waterloo Univ. (Ontario), Dept. of Systems Design.
For primary bibliographic entry see Field 4A.
W77-05145

OVERLAND-FLOW TRAVEL TIME VERSUS REYNOLDS NUMBER,
University of Southern California, Los Angeles. Dept. of Civil Engineering.
S. S. Butler.
Journal of Hydrology, Vol. 32, No. 1/2, p 175-182, January 1977. 1 fig, 1 tab, 9 ref.

Descriptors: *Overland flow, *Travel time, *Reynolds number, Rainfall, Discharge measurement, Flow, Time of concentration, Equilibrium, Integrated control measures, Laminar flow, Turbulent flow.
Identifiers: *Excess rain, Differential expression, Strip flow, Integration, Parameters, Detention storage.

A general expression was estiablished for the time of concentration, or equilibrium, for strip flow, i.e., flow over areas of uniform width. The time was expressed through the interrelationship of excess rain (rain in exesss of current losses), friction, slope, and length, with allowance for possible change from laminar to turbulent flow. In partly turbulent experimental runs, with terminal Reynolds numbers above 1000, the flow consists of two parts--(1) an upper reach of Reynolds numbers below 1000 and therefore laminar, and (2) the remaining lower reach, which is turbulent. Some 'partly turbulent' runs are largely laminar, and others are largely, but not entirely, turbulent. The travel times for these experimental runs, with widely differing percentages of turbulent flow, correlate well as a group when plotted versus the theoretical times. Those runs which are partly turbulent but mainly laminar, plot well with the highly turbulent runs, but they plot very poorly with the all-laminar runs. (Roberts-ISWS)
W77-05149

COMPARATIVE CLIMATIC ANALYSIS OF LOWER MISSISSIPPI RIVER FLOODS: 1927, 1973, AND 1975,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology.
R. A. Muller.
Water Resources Bulletin, Vol. 12, No. 6, p 1141-1150, December 1976. 4 fig, 2 tab, 9 ref.

Descriptors: *Floods, *Climatic data, *Mississippi River, Climates, Climatology, Watersheds(Basins), River basins, Flood plains, Flood stages, Precipitation(Atmospheric), Basins, Hydrographs.
Identifiers: Water budget analysis, Flood seasons, Lower Mississippi River.

Hydrographs of the Mississippi River near Vicksburg, Mississippi, showed that flood stages were higher and the duration of days above flood stage longer during 1927 as compared to 1973 and 1975. Nevertheless, a climatic water budget analysis of the entire Mississippi River basin by climatic divisions for the three flood seasons indicated that surplus precipitation available for runoff and groundwater recharge was greatest during the 1972-1973 flood season. Although upstream storage opportunities in multipurpose reservoirs may have reduced the potential peak stages at Vicksburg, variable groundwater storage opportunities over much of the entire Mississippi River system may have played a significant role. It was recommended that the relationships between regional groundwater tables and long-term climatic variability be studied, so that groundwater factors could be taken into account in terms of both evaluation of relations between land use and river-basin management to floods, and as an aid to predictive flood models. (Roberts-ISWS)
W77-05158

STRONTIUM ISOTOPES IN SELECTED STREAMS WITHIN THE SUSQUEHANNA RIVER BASIN,
Miami Univ., Oxford, Ohio. Dept. of Geology.
R. S. Fisher, and A. M. Stueber.
Water Resources Research, Vol. 12, No. 5, p 1061-1068, October 1976. 5 fig, 1 tab, 17 ref.

Descriptors: *Isotope studies, *Strontium radioisotopes, *Strontium, *Rivers, Tracers, Radioisotopes, Geology, Rocks, Shales, Sandstones, Carbonates, Groundwater, Runoff, Sampling, Chemical analysis, Watersheds(Basins), Tributaries, Aquifers, Hydrology, *Pennsylvania.
Identifiers: *Susquehanna River basin(Pa).

The concentration and isotopic composition of strontium in water samples from the Susquehanna River and its major tributaries between Northumberland, Pennsylvania, and the Chesapeake Bay have been determined to investigate the usefulness of the Sr87/Sr86 ratio as a tracer in hydrologic studies. The Sr87/Sr86 ratios of tributaries, measured just upstream from their confluence with the Susquehanna, show considerable variation, ranging from 0.7091 to 0.7218. These ratios appear to be determined primarily by the local bedrock type and aquifer characteristics. Tributaries whose drainage basins contain important carbonate aquifers have relatively high Sr concentrations and Sr87/Sr86 ratios of about 0.709; where the bedrock is shale with no carbonate rock, the tributaries are characterized by much lower Sr concentrations and Sr87/Sr86 ratios of about 0.716. Tributaries in metamorphic bedrock also have low Sr concentrations and isotopic ratios averaging 0.719. The Sr87/Sr86 ratios of nearly all tributaries in the study area seem to represent a mixture of varying proportions of two distinctly different groundwater types; one with a high Sr concentration and low Sr87/Sr86 ratio, the other characterized by a low Sr concentration and relatively high Sr87/Sr86 ratio. In the northern half of the study area, marked variations in the Sr87/Sr86 ratio of the Susquehanna River indicate incomplete mixing of tributary and mainstream waters, apparently due to the extreme width and small depth-to-width ratio of the Susquehanna. Under favorable geologic and hydrologic conditions, strontium isotopes have potential as a tracer of water provenance. (Sims-ISWS)
W77-05160

LINK LENGTH ORGANIZATION AND NETWORK SCALE DEPENDENCIES IN THE NETWORK DIAMETER MODEL,
State Univ. of New York at Buffalo. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W77-05161

AN APPLICATION OF COMPUTER GRAPHICS TO ANALYSIS OF EXTREMES,
Sargent and Lundy, Chicago, Ill.
G. Burkhardt, and A. Prakash.
Water Resources Bulletin, Vol. 12, No. 6, p 1245-1258, December 1976. 4 fig, 2 tab, 11 ref.

Descriptors: *Hydrologic systems, *Computer models, *Probability, *Statistics, Distribution patterns, Mathematical studies, Equations, Computers, Analysis.
Identifiers: *Return period, *Log Pearson type III distribution, Skewness, Probability paper.

A convenient method for the statistical analysis of hydrologic extremes is to use probability papers to fit selected theoretical distributions to extremal observations. Three commonly accepted statistical distributions of extreme hydrologic events are: the double exponential distribution, the bounded exponential distribution, and the Log Pearson Type III distribution. In most cases, probability papers are distribution specific. But, for the Log Pearson Type III distribution, the probability paper is characterized by a population-specific parameter,

namely, the coefficient of skewness. It is not practicable to procure probability papers for all possible values of this parameter. Therefore, a computer program was developed to generate population-specific probability papers and to perform statistical analysis of the data using computer graphics. Probability papers covering return periods up to 1000 years or more were generated for the three distributions mentioned above. Using a plot routine, available extremal observations were plotted on selected probability papers, and a linear regression analysis was used to fit a straight line to the data. Predictions of hydrologic extremes for higher recurrence intervals can be made by extrapolating the fitted straight lines. (Bhowmik-ISWS)
W77-05164

EVIDENCE FOR NONSTATIONARITY AS A PHYSICAL EXPLANATION OF THE HURST PHENOMENON,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 2B.
W77-05165

A DISTRIBUTED CONVERGING OVERLAND FLOW MODEL 3. APPLICATION TO NATURAL WATERSHEDS,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh.
Water Resources Research, Vol. 12, No. 5, p 902-908, October 1976. 8 fig, 1 tab, 13 ref.

Descriptors: *Overland flow, *Model studies, *Watersheds(Basins), Runoff, Agricultural watersheds, Parametric hydrology, Hydrology, Rainfall-runoff relationships, Mathematical studies, Equations, Flow.
Identifiers: Distributed system, Rosenbrock-Palmer optimization algorithm, Lax-Wendroff scheme, Kinematic wave modeling.

The proposed distributed converging overland flow model was utilized to predict surface runoff from three natural agricultural watersheds. The Lax-Wendroff scheme was used to obtain numerical solutions. For determination of the kinematic wave friction relationship parameter, a simple relation between the parameter and topographic slope was hypothesized. The simple relation contains two constants which are optimized for each watershed by the Rosenbrock-Palmer optimization algorithm. The model results were in good agreement with runoff observations from these watersheds. It was shwon that if the model structure is sound, it will suffice to optimize model parameters on hydrograph peak only, even for prediction of the entire hydrograph. The model results suggested that a distributed approach to kinematic wave modeling of watershed surface runoff is potentially promising and warrants further investigation. (Lee-ISWS)
W77-05168

MODELING MONTHLY HYDROLOGIC PERSISTENCE,
Catholic Univ. of America, Washington, D. C. Dept. of Civil Engineering.
G. K. Young, and R. U. Jettmar.
Water Resources Research, Vol. 12, No. 5, p 829-835, October 1976. 5 fig, 3 tab, 7 ref, 1 append. OWRT C-3029(No. 3730)(2).

Descriptors: *Streamflow, *Persistence, *Model studies, Mathematical models, Runoff, Monthly, Analytical techniques, Statistical analysis, Correlation analysis, Streamflow forcasting, Rivers, Hydrology.
Identifiers: *Streamflow models.

This paper reported an empirical study of the autocorrelations and Hurst parameter properties for monthly streamflow for a set of U.S. Geological Survey gaging stations in the eastern United States. The analysis was motivated by a desire to develop operational criteria to select persistence measures and generating models. The work was part of a larger effort to evaluate the trade-offs between complex and simple data generators. Markov generators are simple in comparison to the more complex self-similar methods. Monthly streamflow data were found to have Hurst statistics similar to annual data. Least squares was presented as a possible method to estimate persistence parameters and to select generating models. Empiric autocorrelations were treated as data in a fit of theoretic covariance functions by minimum squared error. The Hurst and least squares estimators are nearly the same. The lag 1 correlation is much smaller than least squares Markov estimators. A step-by-step procedure was suggested for implementation of least squares persistence analysis. (Sims-ISWS)
W77-05177

A VARIABLE SOURCE AREA MODEL OF THE RAINFALL-RUNOFF PROCESS BASED ON THE WATERSHED STREAM NETWORK,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-05178

AN EVALUATION OF THE PRACTICALITY AND COMPLEXITY OF SOME RAINFALL AND RUNOFF TIME SERIES MODELS,
Purdue Univ., Lafayette, Ind. School of of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-05179

A NORTHERN SNOWMELT-FLOOD FREQUENCY MODEL,
Alaska Univ., College. Inst. of Water Resources.
R. F. Carlson, and P. Fox.
Water Resources Research, Vol. 12, No. 4, p 786-794, August 1976. 6 fig, 4 tab, 11 ref. OWRT B-030-ALAS(1). 14-31-001-4172.

Descriptors: *Model studies, *Snowmelt, *Alaska, *Flood frequency, *Subarctic, Flood forecasting, Water measurement, Rainfall-runoff relationships, Equations, Forecasting, Basins, Frequency.
Identifiers: *Snowmelt-flood frequency model, *Subarctic regions, *Chena River, Sensitivity analysis, Subarctic watersheds.

A rainfall-flood frequency model was examined and converted to a snowmelt-flood frequency model for use in northern subarctic regions. The model was applied to the Chena River at Fairbanks, an interior Alaskan basin, with emphasis on evaluation of the model for use on watersheds with few or no previous discharge records. The evaluation included examination of the theoretical development and assumptions of the original model, adaptation of the original model to a snowmelt-flood frequency model, sensitivity analysis and comparison with results from other techniques, and the observed frequency series. While the model suffered from certain inconsistencies, it did seem to be a useful tool for flood frequency design for subarctic watersheds with sparse data records. (Roberts-ISWS)
W77-05186

A COMPUTER-AIDED SNOWMELT MODEL FOR AUGMENTING WINTER STREAMFLOW SIMULATION IN A SOUTHERN ONTARIO DRAINAGE BASIN,
Ontario Ministry of the Environment, Toronto (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W77-05247

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE INNER COASTAL PLAIN OF SOUTH CAROLINA,
Geological Survey, Columbia, S.C. Water Resources Div.
W. M. Bloxham.
South Carolina Water Resources Commission, Columbia, Report No 5, 1976. 28 p, 5 fig, 1 plate, 2 tab, 14 ref.

Descriptors: *Low flow, *Streamflow, *South Carolina, *Coastal plains, *Flow rates, Surface-groundwater relationships, Water quality, Chemical analysis, *Iron, *Acidic water.
Identifiers: *Inner Coastal Plain(SC).

The Inner Coastal Plain lies diagonally across the center of South Carolina. It consists of primary coastal plain sediments of well-developed relief and receives an average annual rainfall of about 45 inches. The low-flow potential at 74 sites is shown by a display of annual minimum 7-day values on a map of the study area. In some areas, there is conformance to a general pattern but, overall, a wide variability in low-flow characteristics is evident. The primary factors involved are believed to be varying combinations of depth of stream valley incisement, area of recharge to the aquifers, and variability of aquifer yields. Their effect on low flow is not well defined from basin characteristics, and regionalization as a method of estimating low-flow characteristics is not recommended for the Inner Coastal Plain. Except for their general acidic nature and high iron content, the water quality of the streams is excellent. (Woodard-USGS)
W77-05272

LOW-FLOW CHARACTERISTICS OF STREAMS ON THE KITSAP PENINSULA AND SELECTED ADJACENT ISLANDS, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
J. E. Cummans.
Open-file report 76-704, 1977. 19 p, 4 fig, 3 tab, 13 ref.

Descriptors: *Low flow, *Small watersheds, *Low-flow frequency, *Flow duration, *Washington, Gaging stations, Data collections, Regression analysis, Flow characteristics.
Identifiers: *Kitsap Peninsula(Wash).

Low-flow-frequency data are tabulated for 90 streamflow sites on the Kitsap Peninsula and adjacent islands, Washington. Also listed are data for 56 additional sites which have insufficient measurements for frequency analysis but which have been observed having no flow at least once during the low-flow period. The streams drain relatively small basins; only three streams have drainage areas greater than 20.0 square miles, and only nine other streams have drainage areas greater than 10.0 square miles. Mean annual precipitation during the period 1931-60 ranged from about 25 inches near Hansville to about 70 inches near Tahuya. Low-flow-frequency curves plotted from records of streamflow at eight long-term gaging stations were used to determine data for low-flow durations of 7, 30, 60, 90, and 183 days. Regression techniques then were used to estimate low flows with frequencies up to 20 years for stations with less than 10 years of record and for miscellaneous sites where discharge measurements have been made. (Woodard-USGS)
W77-05273

FLOOD OF JUNE 27, 1975, IN CITY OF AMES, IOWA,
Geological Survey, Iowa City, Iowa. Water Resources Div.
O. G. Lara, and A. J. Heinitz.
Open-file report 76-728, October 1976. 56 p, 20 fig, 11 tab, 8 ref.

Descriptors: *Floods, *Flood data, *Flood damage, *Peak discharge, *Iowa, Streamfllow, Flow rates, Gaging stations, Flood frequency, Flood profiles.
Identifiers: *Ames(Iowa).

On June 27, 1975, the city of Ames, Iowa, and vicinity sustained severe flooding from Squaw Creek and the South Skunk River. This was the most severe flood on record, with losses estimated at over a million dollars, and the loss of one life. The peak discharge at the Squaw Creek station was 11,300 cfs, which is 1.6 times the 100-year flood. The South Skunk River above the confluence with Squaw Creek peaked at 5,330 cfs. The recurrence interval of this discharge is 6.0 years. The peak discharge on the South Skunk River below the confluence with Squaw Creek was 14,700 cfs, which is 1.1 times the 100-year flood. The report includes records of stages and discharge during the flood period, a discussion of the meteorologic and hydrologic aspects of the event, some aerial photographs showing the flooded areas, inundation maps, flood-elevation profiles, a discussion of flood frequencies, a brief resume of past floods, and other pertinent data. (Woodard-USGS)
W77-05276

ON THE RUN-OFF CHARACTERISTICS IN THE NIGORI RIVER AND OHORA RIVER BASINS CONSIDERED BY THE SURFACE RUN-OFF (HYOMER RYUSHUTSU O KANGAETA NIGORI GAWA OYOBI OHORA GAWA RYUIKI NI OKERU SHUSUI TOKUSEI NI TSUITE),
N. Takase, and Y. Ujibashi.
Kanazawa Daigaku Kogakubu Kiyo, (Memoirs of the Faculty of Technology, Kanazawa University), Vol. 10, No. 1, p 17-24, 1976. 9 fig, 1 tab, 7 ref.

Descriptors: *Runoff, *Analytical techniques, *Surface runoff, *River basins, Analysis, *Graphical analysis, River systems, Rivers, Tributaries.
Identifiers: *Japan.

The runoff mechanism in river basins is very complicated due to many factors involved. Despite studies, many problems are still unsolved. Several methods for runoff analysis have been introduced, including the runoff function method, unitgraph method, storage function method, and characteristic curve method. However, the runoff phenomena are not entirely clear, as no method of runoff analysis is completely satisfactory. A universal analysis method is desirable. The relationship between variations in river basin characteristics and surface runoff area were studied in the Nigori river basin and Ohora river basin of the Hida river tributary of the Kiso river system, all in Japan. The characteristic curve analysis method was used to analyze runoff. Some unusual data were obtained. (Snyder-FIRL)
W77-05320

DISPERSION OF WATER POLLUTANTS IN A TURBULENT SHEAR FLOW,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 5B.
W77-05346

FLOOD ANALYSIS BY SMEMAX TRANSFORMATION,
N. Bethlahmy.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY1, Proceedings Paper 12701, p 69-78, January 1977. 1 fig, 6 tab, 3 ref, 2 append.

Descriptors: *Flood frequency, *Statistical methods, *Hydrology, *Annual flood, Numerical analysis, Data processing, Streamflow, Methodology, Analytical techniques, Equations, Frequency.
Identifiers: *Transformations, *SMEMAX, Distribution functions.

A transformation, SMEMAX, was proposed for normalizing skewed distributions and for facilitating their analysis. The transformation was based on the analysis of a right triangle whose vertices are represented by the smallest, median, and largest observed values of a population. The base and height of the triangle divide the population into groups whose components are either smaller or larger than the population's median value. The transformed equivalent of any observed value is located on the hypotenuse. Analyses of flood data of 65 rivers in the Northwest corroborate the effectiveness and utility of the SMEMAX transformation, and comparison of the results with those obtained by standard methods reveals the adequacy of the method. (Singh-ISWS)
W77-05360

THE VALUE AND VULNERABILITY OF FRESH WATER ECOSYSTEMS,
Georgia Inst. of Tech., Atlanta. Dept. of Zoology.
For primary bibliographic entry see Field 6G.
W77-05394

CONTRIBUTION OF SUBSURFACE FLOW FROM THE UPPER SLOPES OF FORESTED WATERSHEDS TO CHANNEL FLOW,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
For primary bibliographic entry see Field 2G.
W77-05436

NUMERICAL SIMULATION OF A TWO DIMENSIONAL FLOOD WAVE PROPAGATION DUE TO DAM FAILURE,
Thessaloniki Univ., Salonika (Greece).
For primary bibliographic entry see Field 8B.
W77-05450

2F. Groundwater

SUSTAINED FLOW IN SMALL APPALACHIAN WATERSHEDS UNDERLAIN BY CARBONATE ROCKS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
E. L. White.
Journal of Hydrology, Vol. 32, No. 1/2, p 71-86, January 1977. 7 fig, 6 tab, 18 ref.

Descriptors: *Base flow, *Carbonate rocks, *Appalachian Mountain Region, *Watersheds(Basins), Limestones, Dolomite, Karst, Subsurface drainage, Sinks, Correlation analysis, Surface-groundwater relationships, Subsurface flow, Springs, Fracture permeability, Onsite data collections.
Identifiers: *Internal drainage, *Factor analysis, *Cluster analysis, Groundwater storage, Dolines, Residence time.

The groundwater release from storage as it relates to sustained flows in surface streams was investigated for 57 carbonate basins within the Appalachian Highlands. Comparisons were made between sustained flow and the aerial extent of limestone and dolomite rock outcrop within the basins and with the degree of karst development as measured by internal drainage through dolines and sinking streams. Data analyses by direct correlation, by factor analysis, and by cluster analysis showed that the basins investigated fell into two distinct population: those with sustained flows comparable to flows observed in non-carbonate basins, and those with exceptionally low sustained flows. Basins with a high degree of karst development tended to have low sustained flow because of poor groundwater storage and short residence times in carbonate aquifers with conduit-type permeability. Higher sustained flows were associated with aquifers of the diffuse-flow type. (Visocky - ISWS)
W77-05143

RADIAL FLOW WITH DISCHARGING-WELL AND OBSERVATION-WELL STORAGE,
Nevada Univ. System, Reno. Water Resources Center; and Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 4B.
W77-05144

ANALYSIS OF PERMEAMETER DATA TO OBTAIN PARAMETERS OF NON-DARCY FLOW,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W77-05148

POLYURETHANE FOAM--A USEFUL NEW BOREHOLE GROUT,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 2G.
W77-05150

STRONTIUM ISOTOPES IN SELECTED STREAMS WITHIN THE SUSQUEHANNA RIVER BASIN,
Miami Univ., Oxford, Ohio. Dept. of Geology.
For primary bibliographic entry see Field 2E.
W77-05160

HYDROCHEMICAL CHARACTERISTICS OF GROUND WATERS IN THE LOWLAND BETWEEN THE RIVERS TIMIS AND BEGA, (IN ROMANIAN),
Institutul de Studii si Gercetari Pedologie, Bucharest (Rumania).
N. Florea, L. Vlad, A. Conescu, I. Munteanu, and S. Morgenstern.
An Inst Stud Cercet Pedol. 40, p 463-489, 1972.

Descriptors: Water chemistry, *Groundwaters, Rivers, Mineralogy, Sulfates, Sodium compounds, Sodium Chloride, Bicarbonates.
Identifiers: Romania, Sodium hydrochloride, Timis River(Romania), Bega River(Romania).

The lowland between the rivers Timis and Bega (Romania) weakly drained and unfragmented, shows a water table frequently situated at less than 2-3 m deep and with highly varied mineralizations ranging 0.28-4.22 g/l. The critical depth of ground waters attains 1.7-2.2 m and the critical mineralization is 1-1.5 g/l. The ground waters are of 2 groups, with or without NaHCO3, as the accumulation of salts is different in the 2 cases. The accumulation of salts in ground waters with NaHCO3 occurs by transition from the bicarbonate to the bicarbonate-chloride chemical composition, whereas for ground waters without the NaHCO3 the transition is from bicarbonate to sulfate chemical composition. Soda (NaHCO3, Na2CO3) from ground waters (situated as a rule in boggy areas or with alkaline soils) was formed primarily on account of the reduction of sulfates, thus justifying their low content of sulfates and their high content of chlorides, as compared to NaHCO3-free waters. The association in nature of areas with ground waters containing NaHCO3 with areas free of NaHcO3 is accounted for by the interactions between water ions.--Copyright 1975, Biological Abstracts, Inc.
W77-05166

NUMERICAL PREDICTIONS OF TWO-DIMENSIONAL TRANSIENT GROUNDWATER FLOW BY THE METHOD OF CHARACTERISTICS,
Michigan State Univ., East Lansing. Dept. of Civil Engineering.
D. C. Wiggert, and E. B. Wylie.

Water Resources Research, Vol. 12, No. 5, p 971-977, October 1976. 12 fig, 1 tab, 31 ref. OWRT A-067-MICH(2).

Descriptors: *Groundwater movement, *Model studies, *Mathematical models, Groundwater, Aquifers, Analytical techniques, Finite element analysis, Numerical analysis, Base flow, Subsurface waters, Hydrogeology, Hydrology, *Forecasting.

Unsteady flow in a confined or leaky aquifer can be analyzed by replacing the two-dimensional space domain with a latticework of line elements which intersect at nodal points. Continuity and momentum priniciples were applied to each line element separately, resulting in a system of hyperbolic equations which can be solved by the method of characteristics. Upon combination of the continuity relation and compatibility conditions at each node, and explicit solution for the time-variable piezometric heads and seepage velocities was obtained. An inertial multiplier was introduced in the momentum equation, which varies inversely with the magnitude of the fluid acceleration. The time step, proportional to the multiplier, thus assumes large values, while the method continues to provide accurate, stable results. Numerical examples were compared with analytical solutions, and a nonhomogeneous regional aquifer analysis agreed favorably with a finite element model. The numerical scheme provides ease of programing, reduced computer storage requirements, and reasonable central processing times. (Sims-ISWS)
W77-05173

ENVIRONMENTAL TRITIUM AS A HYDROMETEOROLOGIC TOOL IN THE ROSWELL BASIN, NEW MEXICO, I. TRITIUM INPUT FUNCTION AND PRECIPITATION-RECHARGE RELATION,
New Mexico Inst. of Mining and Technology, Socorro.
D. D. Rabinowitz, G. W. Gross, and C. R. Holmes.
Journal of Hydrology, Vol. 32, No. 1/2, p 3-17, January 1977. 4 fig, 4 tab, 21 ref. OWRT A-037-NMEX(2).

Descriptors: *Groundwater, *Precipitation(Atmospheric), *Tracers, *Tritium, *New Mexico, Aquifers, Artesian aquifers, Groundwater movement, Artesian wells, Water wells, On-site investigations, Recharge, Natural recharge, Groundwater recharge, Rainfall, Fallout, Radioisotopes, Isotope studies.
Identifiers: *Tritium fallout, *Roswell Basin(NM).

Tritium analyses of precipitation collected in central New Mexico in the years 1957-1968 were combined with precipitation distribution patterns in space and time. An empirical tritium input function (effective fallout) for the Roswell artesian basin in southeastern New Mexico was constructed. Rather than linearly related to precipitation, it was found that recharge is proportional to a sliding function of the mean annual precipitation. Proper selection of precipitation measuring stations was of critical importance in constructing the tritium imput function. (See also W77-05175 and W77-05176) (Sims-ISWS)
W77-05174

ENVIRONMENTAL TRITIUM AS A HYDROMETEOROLOGIC TOOL IN THE ROSWELL BASIN, NEW MEXICO, II. TRITIUM PATTERNS IN GROUNDWATER,
New Mexico Inst. of Mining and Technology, Socorro.
D. D. Rabinowitz, G. W. Gross, and C. R. Holmes.
Journal of Hydrology, Vol. 32, No. 1/2, p 19-33, January 1977. 5 fig, 13 ref. OWRT A-037-NMEX(3).

Descriptors: *Groundwater, *Tracers, *tritium, *New Mexico, Aquifers, Artesian aquifers, Groundwater movement, Distribution patterns, Wells, Water wells, On-site investigations, Groundwater recharge, Natural recharge, Rainfall, Precipitation(Atmospheric), Fallout, Radioisotopes, Isotope studies, Hydrogeology.
Identifiers: *Tritium fallout, *Roswell Basin(NM).

The tritium input function was correlated with tritium-time profiles of seven wells. The profiles of these wells were also correlated among each other. Correlation was greatly facilitated by the slug-flow characteristics of the confined fractured carbonate aquifer and by the sharp periodicity of precipitation over the recharge area of this semi-arid basin. Two distinct subregions, characterized by different circulation patterns, were recognized in the basin. Random sampling over an extensive area during a two-year period was sufficient to yield valuable information about residence times and permeability contrasts. (See also W77-05174 and W77-05176)
W77-05175

ENVIRONMENTAL TRITIUM AS A HYDROMETEOROLOGIC TOOL IN THE ROSWELL BASIN, NEW MEXICO, III. HYDROLOGIC PARAMETERS,
New Mexico Inst. of Mining and Technology, Socorro.
D. D. Rabinowitz, G. W. Gross, and C. R. Holmes.
Journal of Hydrology, Vol. 32, No. 1/2, p 35-46, January 1977. 2 fig, 1 tab, 13 ref. OWRT A-037-NMEX(4).

Descriptors: *Groundwater, *Groundwater movement, *Model studies, *New Mexico, *Tritium, *Tracers, Mathematical models, Porosity, Recharge, Natural recharge, Groundwater recharge, Aquifers, Dispersion, Radioisotopes, Isotope studies, Hydrogeology, Hydrology.
Identifiers: *Roswell Basin(NM).

Hydrologic parameters computed on the basis of tritium data were correlated with hydrologic, lithologic, and structural features in the basin. In its northern part, average groundwater velocity, porosity, and effective thickness of the aquifer were found to be of the order of 70 ft/day, 1% and 2 ft, respectively. These parameters were tested by a one-dimensional, time-dependent dispersion equation. The observed trends and magnitudes of tritium variations in well water were reproduced. The average dispersion constant was found to be 70 plus or 5 minus ft. A quantitative analysis of hydrologic parmeters for the central part of the basin was restricted by lack of available data. (See also W77-05174 and A77-05175. (Sims-ISWS)
W77-05176

A SIMPLE CASE OF CONJUNCTIVE SURFACE-GROUND-WATER MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-05198

MAJOR CARBON 14 ANOMALY IN A REGIONAL CARBONATE AQUIFER: POSSIBLE EVIDENCE FOR MEGASCALE CHANNELING, SOUTH CENTRAL GREAT BASIN,
Geological Survey, Reston, Va. Water Resources Div.
I. J. Winograd, and F. J. Pearson, Jr.
Water Resources Research, Vol 12, No 6, p 1125-1143, December 1976.

Descriptors: *Geochemistry, *Water quality, *Groundwater, *Springs, *Carbonate rocks, Aquifers, Faults(Geologic), Nevada, Trace elements.
Identifiers: *Carbon-14, Anomaly, *Great Basin(Nev).

The carbon 14 content of groundwater at the center of a 16-km-long fault-controlled spring line at Ash Meadows in south-central Nevada is 5 times greater than that in water from other major springs along the lineament. The difference in carbon 14 stands in marked contrast to the near identity of all springwaters in alkalinity, pH, carbon 13, oxygen 18, deuterium, tritium, and other major and trace ions. The possible explanations of this major carbon 14 anomaly are evaluated by using all available chemical and isotopic data from basin-wide wells and upland springs tapping the regional carbonate aquifer discharging at Ash Meadows. The four most plausible hypotheses require the presence of a major longitudinal heterogeneity in the distal portion of the groundwater basin to explain the anomaly. Flow channeling with an amplitude of at least 11 km is indicated. The simplifying assumption commonly used in simulation of basin-wide flow through fractured or solution-riddled aquifers, namely, that the aquifer is 'homogenous in its heterogeneity' is not applicable to the dense fractured Paleozoic carbonate rockes comprising the Nevada aquifer; heterogeneities in this aquifer do not cancel each other areally. (Woodard-USGS)
W77-05261

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE INNER COASTAL PLAIN OF SOUTH CAROLINA,
Geological Survey, Columbia, S.C. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-05272

GROUNDWATER LEVELS IN NEBRASKA, 1975,
Geological Survey, Lincoln, Nebr. Water Resources Div.
M. J. Ellis, and D. T. Pederson.
University of Nebraska Lincoln, Institute of Agriculture and Natural Resources, Water Survey Paper No 43, December 1976. 92 p, 22 ref.

Descriptors: *Groundwater resources, *Observation wells, *Water level fluctuations, *Nebraska, Hydrographs, Withdrawal, Groundwater recharge, Precipitation(Atmospheric), Water utilization, Irrigation wells.

Groundwater-level changes in Nebraska are summarized for the year 1975. The amounts of change estimated from predevelopment levels are shown on maps, and hydrographs are used to show trends in water-level changes. Also described are availability of data on water levels, changes in the water-level-measurement program during the year, and the two major causes of water-level changes--recharge from precipitation and withdrawal of groundwater. The largest groundwater use in Nebraska during 1975 was approximately 5 million acre-feet pumped from 49,471 registered irrigation wells. (Woodard-USGS)
W77-05274

GROUND-WATER LEVELS IN OBSERVATION WELLS IN OKLAHOMA, 1971-74,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05275

PROGRESS REPORT ON GEOLOGY OF THE EDWARDS AQUIFER, SAN ANTONIO AREA, TEXAS, AND PRELIMINARY INTERPRETATION OF BOREHOLE GEOPHYSICAL AND LABORATORY DATA ON CARBONATE ROCKS,
Geological Survey, San Antonio, Tex. Water Resources Div.
R. W. Maclay, and T. A. Small.
Open-file report 76-627, November 1976. 65 p, 20 fig, 3 tab, 33 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Carbonate rocks, *Water quality,

*Texas, Data collections, Borehole geophysics, Stratigraphy, Core logging, Geologic mapping, Faults(Geologic).
Identifiers: *San Antonio area(Tex), *Edwards aquifer(Tex).

The Edwards aquifer, which is one of the most productive aquifers in the southwestern military installations, and 17 communities in South Texas. San Antonio, which has a population of about 750,000, obtains its entire water supply from the Edwards. The primary purpose of this progress report is to describe the geology and porosity of the rocks of the Edwards aquifer in the San Antonio and to present preliminary interpretations of borehole geophysical and laboratory data. The data were obtained from geophysical and geologic studies of nine cored test holes, from laboratory analyses of samples of aquifer materials, and from recent stratigraphic studies by Rose (1972). The aquifer is areally divided into a fresh-water zone and a saline zone at the 'bad-water' line. The bad-water line forms the southern boundary of the fresh-water zone and its position is determined by the occurrence of water containing 1,000 mg/liter or more of dissolved solids. Rock characteristics and water chemistry in the fresh-water one differ markedly from those of the saline zone. The high permeability of the aquifer within the fresh-water zone results from open fractures and selectively dissolved facies. (Woodard-USGS)
W77-05277

CONSIDERATION OF TOTAL ENERGY LOSS IN THEORY OF FLOW TO WELLS,
Nevada Univ., Reno, Nev. Desert Research Inst.
R. L. Cooley, and A. B. Cunningham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 717, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Center, Technical Report Series H-W, Publication No. 30, March 1977. 48 p, 7 fig, 1 tab, 17 ref. OWRT A-061-NEV(1), 14-31-0001-5028.

Descriptors: *Aquifer characteristics, Aquifer systems, Aquifer testing, *Groundwater movement, *Water wells, *Unsteady flow, Water supply, *Energy loss, *Flow.

A coupled numerical solution for unsteady flow in single or multiple aquifers and the well penetrating the system was developed. Analysis of hypothetical problems indicates that, because of friction losses and nonuniform flow in the well bore, a significant region of nonradial flow in the aquifer(s) results whenever aquifer hydraulic conductivity is greater than about 0.015 m/min and pumping rate is greater than about 1.2 m3/min. Because of this non radial flow, significant errors in computed aquifer transmissivity can occur whenever aquifer hydraulic conductivity is greater than about 0.03 m/min. Because of unsteady flow in the well bore, flow may be highly nonradial for the first few seconds of pumping irrespective of hydraulic conductivity or pumping rate. Percentage of open area in the screened or perforated section of well bore, Fanning friction factor, and contraction coefficients characterizing flow through the perforations or slots exercise little control on system response for wide variations in their values. Expressions for parameters B and C in the total drawdown equation sw = BQ + CQ2 (where Sw is drawdown in the well and Q is pumping rate) were developed theoretically and show the relationship of these parameters to the basic system parameters used in this study. It is possible that a method of estimating C without use of a step drawdown test could be developed.
W77-05368

A SUMMARY OF GROUND WATER CONDITIONS COASTAL GEORGIA,
Georgia Dept. of Natural Resources, Atlanta. Earth and Water Div.
For primary bibliographic entry see Field 2L.
W77-05395

EXPERIMENTAL STUDY OF WETTING FRONT INSTABILITY INDUCED BY SUDDEN CHANGE OF PRESSURE GRADIENT,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 2G.
W77-05433

GRAVITY DRAINAGE OF A SAND PROFILE UNDER A TIME-DEPENDENT SURFACE FLUX,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
S. N. Webb, and K. K. Watson.
Australian Journal of Soil Research, Vol. 15, No. 1, p. 9-16, March 1977. 8 fig, 2 tab, 4 ref.

Descriptors: *Artificial recharge, *Mathematical models, *Gravitational water, Sands, *Groundwater recharge, Infiltration, *Drainage, Porous media, Soil water movement, Soil profiles.
Identifiers: *Gravity drainage, *Sand profile.

The replenishment of groundwater supplies from recharge trenches often involves the use of water containing quantities of suspended solids which eventually become deposited on the sides and bottom of the trench with a consequent decrease in intake rate. This process is simulated numerically in one dimension by using a finite difference solution of the flow equation with a time-dependent surface flux boundary condition. Three algebraic functions are used to represent the flux change so that different physical characteristics of the system can be studied. The numerical results indicate that for a reasonably slow rate of flux reduction water content and pressure head profiles of a steady state configuration, appropriate to the flux at the time, are obtained. However, with a more rapid flux change unsteady state conditions remain established throughout the profile and predictions of water content and pressure head can only be made using an unsteady state analysis. (CSIRO)
W77-05532

2G. Water In Soils

SOIL WATER AVAILABILITY IN AN ARIZONA MIXED CONIFER CLEARCUTTING,
Rocky Mountain Forest and Range Experiment Station, Flagstaff, Ariz.
For primary bibliographic entry see Field 4D.
W77-05121

ANALYSIS OF PERMEAMETER DATA TO OBTAIN PARAMETERS OF NON-DARCY FLOW,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
M. A. Gill.
Journal of Hydrology, Vol. 32, No. 1/2, p 165-173, January 1977. 3 fig, 1 tab, 4 ref.

Descriptors: *Permeameters, *Seepage, *Data processing, Permeability, Flow, Hydraulic gradient, Velocity, Darcys law, Hydraulic conductivity, Porous media, Laboratory tests, Analytical techniques, Correlation analysis, Soil water movement, Infiltration.
Identifiers: *Non-Darcy flow.

Methods of analysis of the permeameter data were described for determining the coefficnients of linear and quadratic resistivity in non-Darcy flow through porous media. The theoretical analysis of the falling-head permeameter for transitional regime of flow was verified by labortory data. (Sims-ISWS)
W77-05148

POLYURETHANE FOAM--A USEFUL NEW BOREHOLE GROUT,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
J. H. Black.
Journal of Hydrology, Vol. 32, No. 1/2, p 183-188, January 1977. 4 fig, 2 ref.

Descriptors: *Grouting, *Boreholes, *Chemical grouting, On-site investigations, Moisture content, Nuclear moisture meters, Soil moisture, Groundwater, Chemicals, Foaming, Rocks, Fissures(Geologic), Hydrology, Hydrogeology.
Identifiers: *Polyurethane foam, Borehole grout.

A grouting system was described which enables neutron probe access tubes to be installed in hard fissured rock. The method was simple and quick, and it allowed reference to be made directly to borehole core samples. Foaming polyurethane grout enables neutron moisture probe measurements to be made to previously unattained depths in fissured competent rocks. Its particular advantages are its low gamma attenuation, its low neutron cross section, and especially its limited fissure penetration. (Sims-ISWS)
W77-05150

EVALUATION OF THE OPTIMAL THICKNESS OF SOIL BETWEEN SOURCE AND DETECTOR IN THE GAMMA-RAY TRANSMISSION METHOD,
Roorkee Univ. (India). Dept. of Physics.
B. P. Singh, and S. Chandra.
Journal of Hydrology, Vol. 32, No. 1/2, p 189-191, January 1977. 2 fig, 3 ref.

Descriptors: *Soil tests, *Soil moisture, *Soil water, *Soils, *Gamma rays, Moisture content, Moisture, Soil water movement, Absorption, Slopes, Permeability.
Identifiers: *Soil thickness, *Gamma ray transmission, Soil-water system, Soil sample, Scattering, Linear function, Soil columns.

The gamma-ray transmission method for the determination of moisture in soils was reported in 1974. With this method, apart from the choice of gamma-ray source, detector, and electronic equipment, the thickness of the soil has to be fixed for better accuracy. The 1974 data were analyzed for the determination of optimal soil thickness between source and detector. (Roberts-ISWA)
W77-05151

A COMPARISON OF TECHNIQUES FOR SOLVING THE DIFFUSION EQUATION WITH AN EXPONENTIAL DIFFUSIVITY,
Connecticut Agricultural Experiment Station, New Haven.
J.-Y. Parlange, and D. K. Babu.
Water Resources Research, Vol. 12, No. 6, p 1317-1318, December 1976. 8 ref.

Descriptors: *Diffusion, *Diffusivity, *Mathematical studies, Equations, Soil water, Sorption.
Identifiers: *Perturbation, *Exponential diffusivity.

A recent solution obtained by Babu when the soil water diffusivity has an exponential behavior was compared with two earlier solutions. It was shown that with a slight modification, Babu's perturbation solution is identical to the iterative solution using Cisler's correction. It was also shown that solutions which optimize the sorptivity and the front position are numerically indistinguishable from either the perturbation or the iterative solution but have, in general, a much simpler analytical form. (Visocky-ISWS)
W77-05162

THE APPLICATION OF THE OVERBURDEN POTENTIAL THEORY TO SWELLING SOILS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
G. D. Towner.
Water Resources Research, Vol. 12, No. 6, p 1313-1314, December 1976. 2 fig, 8 ref.

Descriptors: *Soil water, *Soils, *Hysteresis, Soil moisture, Moisture content, Physical properties, Pore water, Shrinkage, Mathematical models, Water table, Soil science.
Identifiers: *Swelling soils, *Overburden potential theory.

From a consideration of alternative loading paths in the shrinkage diagram of swelling soils, it was shown that hysteresis in the relationship between the voids ratio and the moisture ratio may occur, even though no actual reversals of loading have been allowed nor any irreversible structural changes have taken place. Therefore, it was argued that the application of the overburden potential theory to the analysis of situations, such as water profiles above water tables in vertical soil columns, is questionable. The need for experimental studies was stressed. (Sims-ISWS)
W77-05167

DISTRIBUTIONS OF WATER AND HERBICIDE IN LAKELAND SAND DURING INITIAL STAGES OF INFILTRATION,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-05180

TILE DRAINAGE IN BEDDED SOIL OR A DRAW,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 4A.
W77-05181

DERIVATION OF EQUATIONS FOR RAINFALL INFILTRATION,
Colorado State Univ., Fort Collins. Engineering Research Center.
H. J. Morel-Seytoux.
Journal of Hydrology, Vol. 31, No. 3/4, p 203-219, December 1976. 5 fig, 14 ref. OWRT B-144-COLO(3), 14-34-0001-6064.

Descriptors: *Infiltration rates, *Unsaturated flow, *Soil water movement, *Theoretical analysis, *Infiltration, Soils, Soil science, Permeability, Rainfall intensity, Porous media, Ponding, Analysis, Equations, Saturation.
Identifiers: Immiscible displacement, Two phase flow, Incipient ponding.

Formulas were derived for prediction of ponding time and cumulative infiltration following ponding under the influence of rainfall. The derivations do not assume immediate saturation at the surface nor a piston displacement of air by water; they include the viscous flow of air. The results were compared with experimental data of Rubin and Steinhardt and a formula proposed by Mein and Larson. (Adams-ISWS)
W77-05182

SUMMER MOISTURE-TEMPERATURE FOR ARCTIC TUNDRA,
California Univ., Irvine, Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2C.
W77-05185

SOIL SAMPLING FROM EXPERIMENTAL FIELDS, (IN ROMANIAN),
Institutul de Studii si Gercetari Pedologie, Bucharest (Rumania).
I. Vintila, and A. Canarache.
An Inst Stud Cercet Pedol. 40, p 145-167, 1972.

Descriptors: Soils, *Sampling, Soil tests, Soil analysis, *Soil physical properties, *Soil chemical properties, *Soil treatment, Conductivity, Hydrogen ion concentration, Nutrients.

Studies were conducted on the size and type of variation of many physical and chemical soil properties in experimental fields located on 3 different soil types. Those soil properties which, as a rule, follow the normal law of frequency distribution showed relatively small and medium variabilities. Low variabilities were recorded for pH values, bulk density, soil separates and total exchangeable bases; medium variabilities for field capacity, resistance to tillage and vertical cutting, infiltration curve parameters, and availble K content; high variabilities for: water content, hydraulic conductivity, penetration resistance, shear strength, hydrolytic acidity and contents of Mn, Fe, available P and exchangeable Al. The variability within the experimental plots was usually positively correlated to varibility due to the experimental treatments. For determining the penetration resistance in the field, about 10 determinations are to be made in every plot.--Copyright 1975, Biological Abstracts, Inc.
W77-05189

A FIELD STUDY OF SOIL WATER DEPLETION PATTERNS IN PRESENCE OF GROWING SOYBEAN ROOTS: II. EFFECT OF PLANT GROWTH ON SOIL WATER PRESSURE AND WATER LOSS PATTERNS,
Minnesota Univ., St. Paul. Dept. of Soil Science.
L. M. Anya, G. R. Blake, and D. A. Farrell.
Soil Science Society of America Proceedings, Vol. 39, No. 3, p 430-436, May-June 1975. 9 fig, 1 tab, 15 ref. OWRT B-015-MINN(11).

Descriptors: *Soybeans, *Soil water, *Soil water movement, Soil properties, Soil-water-plant relationships, Root systems, Plant growth, Root zone.
Identifiers: *Soil water depletion.

Soil-water pressure and water-loss patterns in the root zone of soybean were determined from daily observations during irrigation-drying cycles for four growth periods after planting. Tensiometric measurements of soil water pressure were made on a 10-cm square grid from one plant row to an adjacent one spaced 80 cm apart, and between 10- and 70-cm depths. Water contents were inferred from pressure-water content relationships. (See also W76-02933 and W77-05200) (Skogerboe-Colo St)
W77-05199

A FIELD STUDY OF SOIL WATER DEPLETION PATTERNS IN PRESENCE OF GROWING SOYBEAN ROOTS: III, ROOTING CHARACTERISTICS AND ROOT EXTRACTION OF SOIL WATER,
Minnesota Univ., St. Paul, Dept. of Soil Science.
L. M. Arya, G. R. Blake, and D. A. Farrell.
Soil Science Society of America Proceedings, Vol. 39, No. 3, p 437-444, May-June 1975. 8 fig, 3 tab, 30 ref. OWRT B-015-MINN(12).

Descriptors: *Soybeans, *Soil water, *Soil water movement, Soil properties, Soil-water-plant relationships, Root systems, Root development, Root distribution, Root zone.
Identifiers: *Soil water depletion.

Rooting characteristics water extraction patterns in the root zone of a mature soybean crop were determined in the field. Rates of water extraction by the roots in the various 10-cm intervals were computed over an irrigation-drying cycle, 81 to 91 days after planting. In the 10- to 30- and 60- to 70-cm layers the extraction rate decreased with time. In the 30- to 60-cm layer and initial decrease was followed by a substantial increase later in the cycle. Total extraction between 40 anf 240 hours after irrigation decreased with depth--1.32 cm in the 10- to 20-cm layers and 0.25 cm in the 60- to 70-cm layers. Extraction rate for the 10- to 70 cm soil during the 47- to 56- and 81- to 91- days growth periods showed an initially rapid decrease following irrigation but reached constant levels of 0.48 and 0.39 cm/day, respectively. (See also W76-02933 and W77-05199) (Skogerboe-Colo St)
W77-05200

DETERMINATION OF TOTAL MERCURY IN SOILS AND SEDIMENTS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W77-05201

THE CHEMISTRY OF LEAD AND CADMIUM IN SOIL: SOLID PHASE FORMATION,
Utah State Univ., Logan. Dept. of Soil Science and Micrometeorology.
For primary bibliographic entry see Field 5B.
W77-05202

CHANGE OF ORGANIC SUBSTANCES IN VIRGIN AND ARABLE CINNAMONIC CALCAREOUS MOUNTAIN SOILS DEPENDING ON THE DEGREE OF THEIR EROSION, (IN RUSSIAN),
For primary bibliographic entry see Field 2J.
W77-05220

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, JOHN DAY DRAINAGE BASIN.
Oregon Agricultural Experiment Station, Corvallis.
Prepared for the Oregon State Water Resources Board, 1969, Appendix I-6. 101 p, 3 fig, 13 tab, 2 map.

Descriptors: Soils, *Soil surveys, *Soil profiles, *Soil types, Runoff, Irrigation, *Drainage, *Oregon, Soil texture, Soil moisture, Permeability, Water management(Applied), Root zone, *Water requirements, *Irrigable land, *Watersheds(Basins).
Identifiers: *John Day Drainage Basin(OR), Available water-holding capacity(AWHC), Shrink-swell potential, Erosion hazard, Temperature limitation.

Soil survey information of the National Cooperative Soil Survey program in Oregon was used to map, describe and interpret soils in 3,749,200 acres (over 1 million of which are suitable for agriculture or pasture production) of the John Day Drainage Basin located in north central Oregon. Soils are interpreted in relation to water use and management. Soil series consist of soils essentially uniform in characteristics such as texture, structure, arrangement of horizons, etc. Poorly drained soils, such as silvies soils, are located primarily in Grant and Umatilla Counties, comprising the basin of the North Fork John Day. A guide for interpretations of irrigability of soils is presented, with irrigation suitability rated according to 12 characteristics. Soils with excellent and good suitability for irrigation are found in Hack, Ritzville, Walla Walla, Esquatzel, Hermiston, Kimberly, Onyx, and Powder soils, all with 0-3 percent slope. Soils unsuited for irrigation are characterized by poor drainage, shallow and stony soils, and steep slopes. Four hydrological groups (runoff potential) are given based on profile features such as depth, texture, permeability and mottling. Soils with highest potential for unoff as Anatone, Anatone-(Al), Bakeoven, Bakeoven-Condon, Boyce, Damon, Day, (Do), Ephra-variant, Fopiano, Grell, Gwin, Lickskillet, Oxbow, Ridgeway, Rock Creek, Rock land, Scabland-biscuit complex, Silvies, Starbuck. Range soils groupings are also described. The soil series and land types found in the John Day Basin are described in detail. (Gentry-NC)
W77-05285

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, DESCHUTES DRAINAGE BASIN.
Oregon Agricultural Experiment Station, Corvallis.
Prepared for the Oregon State Water Resources Board, 1969, Appendix I-5. 116 p, 3 fig, 10 tab, 2 map.

Descriptors: Soils, *Soil surveys, *Soil profiles, Soil properties, *Soil types, *Infiltration, *Infiltration rates, Runoff, Irrigation, *Drainage, *Oregon, Soil texture, Soil moisture, Permeability, Water management(Applied), Root zone, *Water requirements, *Irrigable land, *Watersheds(Basins).
Identifiers: *Deschutes Drainage Basin(OR), Available water-holding capacity(AWHC), Shrink-swell potential, Erosion hazard, Temperature limitation.

A general inventory of the soil resources of the Deschutes Drainage Basin in central Oregon is presented. Of the 6.5 million acres in the basin, nearly 2 million acres are suited for cultivated crops or improved pasture. Major physiographic categories are valley lands and basins, mid-basin plateaus (mostly Dalles formations), pumice-mantled lava plains and buttes, grassland-shrub upland, lower basin lava plateau, forested plateaus and highlands. Elevations vary from 200 feet at the Columbia River to 10,000 feet along the crest of the Cascade Mountains. Alkali soils, with an excess of exchangeable sodium making soils unfavorable for water movement and root penetration, are found largely in Crook County on the Lower and Upper Croked River sub-basins. Twelve soil/land characteristics are rated for suitability for irrigation by ratings--excellent, good/fair, poor, very poor/nonirrigable. Soil series with excellent irrigation suitability are Hack, Metolius, Powder, and Unit 1. Soils subject to occasional flooding are Boyce, Crooked, Dayman, Dilman, Metolius, Powder, Veazie, Wickiup and Units 1, 3, and 13. Soils are analyzed according to runoff, permeability, available water-holding capacity (AWHC), effective root zone, shrink-swell potential, workability, erosion hazard, and temperature limitations. Reconnaissance classification units, soil series and land types identified in the basin are described. (Gentry-NC)
W77-05286

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS. HOOD DRAINAGE BASIN,
Oregon Agricultural Experiment Station, Corvallis.
Prepared for the Oregon State Water Resources Board, Salem, 1969. Appendix I-4. 58 p, 2 fig, 10 tab, 2 map.

Descriptors: *Water resources, *Soils, *Soil properties, *Drainage, *Runoff, *Root zone, *Permeability, Irrigation, *Oregon, Water management, *Irrigable land, *Water requirements, *Watersheds(Basins).
Identifiers: Shrink-swell potential, *Available water-holding capacity(AWHC), *Hood Drainage Basin(OR), Soil series, Soil limitation.

A soil inventory for 654,500 acres (of which 200,000 are generally suitd for agriculture) of the Hood Drainage Basin in north central Oregon is presented. Soil interpretations relate to water use and managemet. The four main physiographic divisions are valley terraces, the Cascade Mountains, the west Columbia Plateau and the Columbia Plateau. The soil map, including slope, was drawn from unpublished soil survey field sheets of the Soil Conservation Service. Soils are interpreted according to degree of impeded drainage, hydrologic (runoff potential) soil groups, and irrigation suitability. The most poorly drained soils are Dee and Wyeast soils requiring artificial drainage from most crops. Soil series with highest potential for runoff (usally less than 20 inches of soil to bedrock) are Bakeoven, Lickskillet, Rock land, Skyline, and Lava flows. Characteristics of soils not suitable for irrigation are: sand with less than 3-inch available water-holding capacity (AWHC) in root zone; less than 10 inches of soil above clean sand or permeable soils; textural modifiers of tillage layer consisting of more than 70% gravel or 50% cobbles; inability to clear away stones; rockiness on more than 10% of soil surface; less than 3 inches of AWHC; slope of more than 20-25%; water table above 18 inches for most of the growing season; overflow occurring more than 3 times in 10 years; less than 4 feet to impermeable barrier impeding internal drainage. Soil properties discussed are runoff, permeability, AWHC, effective root zone, shrink-swell potential, workablility, erosion hazard, temperature limitation, and major soil limitations. The soil series and land types identified in the Hood Basin are described. (Gentry-NC)
W77-05298

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, WILLAMETTE DRAINAGE BASIN,
Oregon Agricultural Experiment Station, Corvallis.
Prepared for the Oregon State Water Resources Board, Salem, 1969, Appendix I-2. 131 p, 4 fig, 11 tab, 12 ref, 2 map.

Descriptors: Soils, *Soil properties, *Soil types, *Flood plains, *Root zone, *Drainage, *Permeability, *Soil moisture, *Mapping, *Oregon, Alluvium, Erosion, Deposition, Climate, Precipitation, Vegetation, Topography, Irrigation, Flood frequency, Runoff, *Water requirements, *Irrigable land, *Watersheds(Basins).
Identifiers: *Willamette River Basin(OR), *Available water-holding capacity(AWHC), Shrink-swell potential, Erosion hazard, Soil limitation, Septic tank drain field.

An inventory of soil information in the 7.7 million acres of the Willamatte River basin in northwest Oregon is presentd to aid general planning of resource development. Soil characteristics are determined in part by suface age and by flood erosion and deposition so there is a correlation between soil series, land form and frequency of flooding. The Willamette Basin includes the eastern slope of the Coast Range, the western slope of the Cascade Mountains, and the Willamette Valley lowlands. Elevation range from sea level to over 10,000 feet. Six major soil-landscape classification are discussed: flood plains, alluvial fans and lakebeds; stream cut terraces; broad valley-floor terraces; high valley-margin terraces and silt-mantled foodslopes; foothills under moderate precipitation; mountainous uplands with high precipitation. Twelve soil or land characteristics are rated for irrigation suitability; soils are grouped according to their suitability for irrigation. Soil properties discussed are: permeability, available water-holding capacity (AWHC), effective root zone (usable soil in upper 60 inches),l shrink-swell potential (change in soil volume related to change in moisture content), workability, erosion hazard, major soil limitation (restricting agricultural uses), and septic tank drain field limitation. Soil groups are analyzed according to degrees of impeded drainage, irrigation suitability, frequency of flooding, and hydrological soil groups (mesuring runoff potential). Technial reviews of soil series and mapping units are given. (Gentry-NC)
W77-05299

AN EXPERIMENTAL AND SIMULATION STUDY OF WASTE EFFLUENT FILTRATION THROUGH SOIL,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5B.
W77-05321

THE CONCISE FORMULATION OF DIFFUSIVE SORPTION OF WATER IN A DRY SOIL,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
W. Brutsaert.
Water Resources Research, Vol. 12, No. 6, p 1118-1124, December 1976. 1 tab, 38 ref.

Descriptors: *Sorption, *Soil water, *Infiltration, *Model studies, Mathematical models, Soils, Soil moisture, Moisture content, Soil moisture movement, Diffusion, Equations, Diffusivity, Wetting, Mathematical studies, Soil science.
Identifiers: Wetting fronts.

Several formulations for the sorption of water in a dry soil obtained on the basis of approximate solution of the nonlinear diffusion were considered, and their relative merits were investigated. In addition, new solutions were developed by the application of a simple weighting of the available approximations. In a comparison with one of Philip's exact solutions, it was found that the error involved in all these solutions is, at most, of the order of 3 or 4%; however, Parlange's optimization result and the weighting solutions appear to be accurate to within a few thousandths. The sorptivity and the position of the wetting front can be expressed concisely as functions of soil physical parameters by applying either the two-parameter exponential diffusivity of Gardner and Mayhugh or the three-parameter power function diffusivity of the author. The mathematical form suggests that on a field or basinwide scale, the sorptivity of the surface soil is log normally distributed. (Sims-ISWS)
W77-05340

A PERTURBATION SOLUTION FOR A NON-LINEAR DIFFUSION EQUATION,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
P. L.-F. Liu.
Water Resources Research, Vol. 12, No. 6, p 1235-1240, December 1976. 2 fig, 2 tab, 17 ref. NSF ENG76-09421.

Descriptors: *Diffusion, *Soil water, *Mathematical models, Equations, Sorption, Boundaries(Surfaces), Diffusivity, Mathematics, Analytical techniques.
Identifiers: *Perturbation, Nonlinear equations, Concentration.

Nonlinear diffusion problems with a constant boundary condition were investigated. The concept of diffusion front was utilized to develop a perturbation solution. Results were presented for two specific diffusivities which are functions of the concentrations. The present technique was shown to be efficient and accurate. (Visocky-ISWS)
W77-05343

HYSTERETICAL MODELS FOR PREDICTION OF THE HYDRAULIC CONDUCTIVITY OF UNSATURATED POROUS MEDIA,
Colorado State Univ., Fort Collins. Engineering Research Center.
Y. Mualem.
Water Resources Research, Vol. 12, No. 6, p 1248-1254, December 1976. 12 fig, 12 ref, 1 append. NSF ENG-7611542.

Descriptors: *Hysteresis, *Hydraulic conductivity, *Model studies, Mathematical models, Moisture content, Capillary conductivity, Porous media, Unsaturated flow, Groundwater, Soil water, Pore pressure, Pore water, Soil science.

A theory which permits a quantitative prediction of the actual phenomena of considerable hysteresis characterizing the hydraulic conductivity-capilary head relationships, and the less significant hydraulic conductivity-moisture content hysteresis, was proposed. The models used to represent

capillary hysteresis were extended to permit the prediction of the hydraulic conductivity of unsaturated porous media for any continuous process of imbibition and drainage. The generalized models require the same amount of experimental data as the previous models, with the addition of a measured value of the hydraulic conductivity at a definite point. For an incompleter measured theta (psi) loop, the knowledge of K at the minimum measured value of psi can be used to improve prediction. The dependent domain model suggested by Mualem and Dagan was generalized by adding two functions, KL(psi) and KH(psi). All K(psi) scanning curves were expressed with the aid of KL(psi) and KH(psi) by convenient compact formulation similar to that used to describe the theta (psi) curves. Very good agreement between theory and observations was found. The predicted K(psi) hysteresis has all the experimentally observed features. The prdicted K(theta) hysteretical loop almost shrinks to a unique curve, though the psi(theta) loop, used as data, is of considerable extent. (Sims-ISWS)
W77-05344

ASSESSMENT OF AVAILABLE WATER STORAGE CAPACITY OF SOILS WITH RESTRICTED SUBSOIL PERMEABILITY,
Commonwealth Scientific and Industrial Research Organization, Townsville (Australia). Div. of Tropical Crops and Pastures.
R. L. McCown, G. G. Murtha, and G. D. Smith.
Water Resources Research, Vol. 12, No. 6, p 1255-1259, December 1976. 3 fig, 25 ref.

Descriptors: *Storage capacity, *Soil water, *Soil moisture, *Root zone, *Permeability, Soils, Water storage, Tropical regions, On-site investigations, Sampling, Ponding, Subsoil, Soil water movement, Soil horizons, Soil science.
Identifiers: Water accession, *Subsoil water.

The pasture production of most of the tropics is largely a function of the water regime. One of the few options for control of the water regime in these environments is choice of site. A site parameter of great importance is the available water storage capacity (AWSC) in the root zone. Although estimation of the AWSC is straight-forward on freely drained soils, it is complicated on poorly drained soils by the inapplicability of the concept of field capacity. The latter soils, however, commonly have a buildup of salts at depth in the profile, presumably due to prevailing leaching conditions. The study reported herein was conducted to test the hypothesis that this salt profile can be used to indicate the depth of wetting under conditions similar to those producing maximum subsoil water recharge in this climate. Twenty sites on mainly texture contrast soils, most with poorly drained subsoils, were examined in detail. A close relationship between the observed depth of wetting and the depth to the salt bulge was found. This relationship, together with the total porosity of the top (wettest) stratum of the B horizon, provides a means of estimating the AWSC of the subsoil. (Sims-ISWS)
W77-05345

ON SOLVING THE INFILTRATION EQUATION--A COMPARISON OF PERTURBATION AND ITERATIVE TECHNIQUES,
Connecticut Agricultural Experiment Station, New Haven.
J.-Y. Parlange, and D. K. Babu.
Water Resources Research, Vol. 12, No. 6, p 1315-1316, December 1976. 10 ref.

Descriptors: *Infiltration, *Gravity, *Diffusivity, Mathematical models, Analytical techniques, Soils, Equations, Soil water, Moisture content, Soil moisture, Soil water movement, Soil science.
Identifiers: *Perturbation techniques, *Iterative techniques.

A recent solution obtained by Babu following a perturbation method was compared with an earlier iterative method. It was shown that after improvement, Babu's perturbation solution becomes identical to the iterative solution using Cisler's correction. A simpler solution based on an optimal scheme was also presented. (Sims-ISWS)
W77-05348

SIMULATION OF PROFILE WATER STORAGE AS RELATED TO SOIL HYDRAULIC PROPERTIES,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences; and Texas Agricultural Experiment Station.
D. Hillel, and C. H. M. van Bavel.
Soil Science Society of America Journal, Vol. 40, No. 6, p 807-815, November-December 1976. 12 fig, 1 tab, 18 ref.

Descriptors: *Simulation analysis, *Water storage, *Mathematical models, Soils, Soil moisture, Soil texture, Infiltration, Evaporation, Particle size, Water conservation, Soil physics, Graphical analysis.
Identifiers: *Profile water storage, Soil hydraulic properties, Dynamic modeling, Soil-water relations, Pore size, Soil-water characteristics, Water retentivity.

A previously published numerical model of soil water dynamics was used to simulate the separate and combined processes of infiltration, drainage, and evaporation as determined by hydraulic properties. Three hypothetical soils were compared: sand, loam, and clay. Typical soil moisture characteristic functions were assigned to each, and the respective hydraulic conductivity functions were calculated. Uniform profiles of these soils then were subjected to various sequences of rainstorms and dry periods. The sandy soil provided the least evaporation and the most rapid downward flow, resulting in the most effective storage under a relatively dry regime. The situation was reversed in the case of the clay soil, which stored the most water under a relatively wet regime. The loam exhibited intermediate behavior. Some consequences of this pattern affecting arid zone ecology were discussed. (Roberts-ISWS)
W77-05349

EVALUATION OF A CAPILLARY BUNDLE MODEL FOR DESCRIBING SOLUTE DISPERSION IN AGGREGATED SOILS,
Florida Univ., Gainesville. Dept. of Soil Science.
P. S. C. Rao, R. E. Green, L. R. Ahuja, and J. M. Davidson.
Soil Science Society of America Journal, Vol. 40, No. 6, p 815-820, November-December 1976. 4 fig, 2 tab, 21 ref.

Descriptors: *Capillary action, *Mathematical models, *Dispersion, *Soil aggregates, *Hawaii, Solutes, Equations, Theoretical analysis, Pore water, Velocity, Porous media, Soil water movement, Interstices, Tropical regions.
Identifiers: *Pore geometry, *Pore-velocity distribution, *Miscible displacement, Tropical soils, Flow paths, Breakthrough curves, Pore-size distribution.

A simple capillary bundle model was evaluated for describing solute dispersion in two well-aggregated soils of Hawaii. The model enables the use of pore water velocity distribution rather than an average pore water velocity. The pore size distribution was calculated from the soil water characteristic data. The position and relative shape of the breakthrough curves calculated bundle model were dependent more on the pore water velocity distribution than on dispersion, owing to mixing within a pore. The predicted breakthrough curves were extremely skewed and did not describe the measured curves. The mixing of solute between adjacent flow paths, a process not accounted for in the model, apparently resulted in failure of the model. A measure of pore accessibility and interconnectedness of pore sequences is essential for quantitative description of the influence of soil pore geometry on solute dispersion. (Visocky-ISWS)
W77-05350

COUPLING PHENOMENA IN SATURATED HOMO-IONIC MONTMORILLONITE: II. THEORETICAL,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
P. H. Groenevelt, and D. E. Elrick.
Soil Science Society of America Journal, Vol. 40, No. 6, p 820-823, November-December 1976. 11 ref.

Descriptors: *Saturated soils, *Mathematical models, *Ion transport, Theoretical analysis, *Montmorillonite, Equations, Clays, Electrodes, Anions, Cations, Aqueous solutions, Salts, Thermodynamics.
Identifiers: *Coupling phenomena(Soils), *Onsager reciprocal relations, Double layer theory, Electric charge.

A theory was presented for the formulation of flux equations which describe the transport of water, salt, and electric charge through clays. This theory was based on thermodynamic principles. Model considerations led to analytical expressions for the transport coefficients. The model calculations were based on electric double layer theory and produced a symmetric matrix of coefficients. The difference between former theories and model calculations is that the analysis is for electrodes which are reversible to the anions instead of the cations. The impact of this difference on the magnitude of some of the coefficients on some of the physico-chemical responses of the system is formidable. (Visocky-ISWS)
W77-05351

RAPID DETERMINATION OF UNSATURATED HYDRAULIC CONDUCTIVITY IN TILLED AND UNTILLED LOESS SOIL,
Goettingen Univ. (West Germany). Institut fuer Pflanzenbau und Pflanzenzuechtung.
W. Ehlers.
Soil Science Society of America Journal, Vol. 40, No. 6, p 837-840, November-December 1976. 3 fig, 4 tab, 12 ref.

Descriptors: *Hydraulic conductivity, *Soils, *Loess, Till, Diffusivity, Porosity, Infiltration, Evaporation, Seepage, Permeability, Unsaturated flow, Moisture content, Moisture tension, Soil properties, Soil science.
Identifiers: Zero-tillage.

A rapid method recently developed for determining moisture diffusivity and unsaturated hydraulic conductivity in undisturbed soil cores was employed to calculate the hydraulic functions of the upper layers of tilled and untilled loess soil. The results obtained with the new method compare well with results obtained by a field method. Diffusivity functions as influenced by tillage and depth were significantly different. Conductivities were highest in the 20-30-cm layer of untilled soil and were lowest in the same layer of tilled soil. The number of replicates necessary to evaluate the hydraulic functions with arbitrarily specified precision was calculated. For the soil under study, 5 to 9 samples are needed when upper and lower limits of the 95% confidence interval of diffusivity means are defined not to be different more than by a factor of three. (Sims-ISWS)
W77-05352

PERSISTENCE OF SUBSOIL COMPACTION IN A MOLLISOL,
Minnesota Univ., St. Paul.
G. R. Blake, W. W. Nelson, and R. R. Allmaras.

Soil Science Society of America Journal, Vol. 40, No. 6, p 943-948, November-December 1976. 7 fig, 3 tab, 15 ref.

Descriptors: *Hydraulic conductivity, *Soil compaction, *Clay loam, *Minnesota, Soils, Soil properties, Persistence, Bulk density, Freezing, Crops, Alfalfa, Corn(Field), On-site investigations, Irrigation, Moisture content, Root zone, Root development, Farm management, Agriculture, Soil science.
Identifiers: Soil packing, Packing persistence, *Mollisol.

Persistence of subsoil compaction was tested in Nicollet clay loam (a Mollisol) in southwestern Minnesota. Plots either were not packed, or were packed in 1960 in the bottom of each plow furrow, using about 7.5 bars pressure, and were cropped to corn and alfalfa for 9 years. Halves of plots were irrigated each year just prior to soil freezing. All plots were tilled with normal farm equipment after initial packing. Soil bulk density below the plow layer did not change over the 9-year period, but there were small trends for increased bulk density on the not-packed subsoil. The packed layer was easily identified by penetrometer measurements. Alfalfa root samples taken at the close of the experiment showed that packing reduced mean root weights by as much as 36% in the 40- to 90-cm layer compared to 11% or less in the surface 40 cm. Packing affected the distribution of taproots and fibrous roots in the profile. Soil hydraulic conductivity (K), either saturated or unsaturated, was reduced by packing. Decreases in saturated K averaged 65% in 10-cm soil depths between 21 and 48 cm, and 56% between 61 and 88 cm. Unsaturated K measured in situ also showed persistence of the packing treatment in the 18 to 55-cm soil layer. (Sims-ISWS)
W77-05353

EFFECT OF PORE WATER PRESSURE ON SAND SPLASH,
Agricultural Research Service, Morris, Minn.
For primary bibliographic entry see Field 2J.
W77-05354

FLOW IN A SOIL LAYER UNDERLINED BY AN IMPERMEABLE MEMBRANE,
Technion-Israel Inst. of Tech., Haifa. Dept. of Soil Science.
M. Garber, and D. zaslavsky.
Soil Science, Vol. 123, No. 1, p 1-9, January 1977. 7 fig, 3 ref.

Descriptors: *Soil water movement, *Slopes, *Model studies, Mathematical models, Soil water, Irrigation, Precipitation(Atmospheric), Rain, Subsurface flow, Membranes, Infiltration, Soil science.
Identifiers: Impermeable membranes.

Analytical solutions for a lateral flow process in a sloped soil layer were obtained for saturated, unsaturated, and partially saturated states of the layer profile. The solutions obtained relate to the initial stage of the process. These solutions can provide estimates about the order of magnitude of flows in more realistic, time-dependent, finite problems, e.g., upper-bound discharge, total available volumes, etc. In cases of unsaturated or partially saturated states of the profile, the discharge, Q, is not a monotonic function of the slope, alpha, and has a maximum in the range 0 deg less than alpha less than 90 deg. In contrast, in the completely saturated state of the profile mean Q is a monotonic function of alpha, with a maximum at alpha = 90 deg. (Sims-ISWS)
W77-05361

SIMULATION OF SOIL WATER DYNAMICS IN LAYERED SOILS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
D. Hillel, and H. Talpaz.
Soil Science, Vol. 123, No. 1, p 54-62, January 1977. 17 fig, 1 tab, 14 ref.

Descriptors: *Soil water movement, *Soil texture, *Model studies, Mathematical models, Hydraulic conductivity, Infiltration, Drainage, Evaporation, Water storage, Moisture content, Soils, Soil types, Sands, Loam, Clays, Soil properties, Soil science.
Identifiers: *Soil textural layers, Soil layers, Layered soils.

A numerical model of soil water dynamics was devised to simulate infiltration, drainage evaporation, and water storage in texturally layered profiles. The layers consisted of sandlike, loamlike, and claylike soil of known hydraulic properties. Data presented on the flow patterns of the variously stratified profiles illustrate the interactions between soil and weather variables which grovern profile water storage. Fine-textured layers tend to impede infiltration but, in the long run, may promote drainage of overlying layers. Top layers of coarse texture tend to inhibit evaporation. Since the relative hydraulic conductivities of layers of different textures vary as soil moisture suction changes in time, it seems extremely difficult to predict the dynamic behavior of composite profiles without the benefit of a comprehensive simulation model. Shortcomings of the present model were ponted out, however. (Sims-ISWS)
W77-05362

RECYCLING OF SEWAGE EFFLUENT BY IRRIGATION: A FIELD STUDY ON OAHU, FINAL PROGRESS REPORT FOR AUGUST 1971 TO JUNE 1975.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W77-05372

SOILS INFORMATION FOR COASTAL GEORGIA,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 2L.
W77-05398

UTILIZATION OF SOILS INFORMATION IN COASTAL AREA MANAGEMENT,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2L.
W77-05407

EXPERIMENTAL STUDY OF WETTING FRONT INSTABILITY INDUCED BY SUDDEN CHANGE OF PRESSURE GRADIENT,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
I. White, P. M. Colombera, and J. R. Philip.
Soil Science Society of America Journal Vol. 40, No. 6, p 824-829, November-December, 1976. 8 fig, 2 tab, 10 ref.

Descriptors: *Infiltration, *Model studies, *Pressure, Soil water, *Soil water movement, Fluid mechanics, Porous media, Hydraulics, Soils, Soil physics.
Identifiers: Hele-Shaw model, Wet front instability, Delta function model, Hele-Shaw cell, Contact angle, Air-liquid interface.

Twenty-two experiments were performed on stability of infiltration flows in Hele-Shaw cells. Flows were perturbed by suddenly changing G, the pressure gradient behind the wetting front, from a definite negative to a definite positive value. Three methods were used: (1) increasing air pressure ahead of the front, (2) employing a nonwetting stratum, and (3) suddenly stopping liquid supply and preventing air entry. Glycerol and silicone, with contrasting properties, were used as the infiltrating liquids. The experiments confirmed the theory of Philip: immediately G was made positive, all flows became unstable; and the observed wavelength of fingering agreed closely with those predicted by the theory. A modification of the theory to take account of the geometry of the microscopic air-liquid interface predicted wavelengths in soil about twice as large as does the orignial theory. A preliminary expriment on infiltration of water in a coarse sand confirmed the theory qualitatively, but the observed wavelenght was twice the one predicted theoretically. In a preliminary experiment on infiltation in a fine sand, perturbation failed to produce instability. This divergence from theory was attributed to deviations from the delta-function model on which the theory is based. Further experimental and theoreticl work is needed. (Lee-ISWS)
W77-05433

ERROR PROPAGATION IN DETERMINING HYDRAULIC CONDUCTIVITIES FROM SUCCESSIVE WATER CONTENT AND PRESSURE HEAD PROFILES,
California Univ., Riverside.
H. Fluhler, M. S. Ardakani, and L. H. Stolzy.
Soil Science Society of America Journal, Vol. 40, No. 6, p 830-836, November-December 1976. 7 fig, 14 ref.

Descriptors: *Hydraulic conductivity, *Conductivity, Pressure head, Field capacity, Drainage, Variability, Spatial distribution, Soils, Moisture content, Monte Carlo Method, Darcys law.
Identifiers: *Error propagation, Pressure head profiles, Transient drainage method, Spatial variability.

The flux of water in unsaturated soils can be determined indirectly by using Darcy's Law. The critical part of this approach is the determination of the hydraulic conductivity at a given depth and time. The relative errors of hydraulic conductivities determined from a transient drainage field experiment were analyzed. Knowing the errors of this method would be useful in planning future experiments because it allows putting limitations on the conclusions drawn from such experiments and re-examination of already published field data. In the wet range of the conductivity function, errors were 20-30% of the k-value. In the range where k-values were small, the relative errors could be greater than 100%. Errors stemming from tensiometer readings were significant when the hydraulic gradient was less then 0.3 mbar/cm. During the early stage of the transient drainage experiment, these errors were always considerable and were more important than other errors. On the other hand, the errors in the measured water content changes were dominant when drainage was slowed down due to desaturation of the soil.The errors contained in the conductivity, k, were calculated by means of error propagation equations. These errors were also simulated using the Monte Carlo techniques, which shows that the conductivity errors predicted by explicit error propagation equations were optimistic minimum estimates. (Roberts-ISWS)
W77-05434

EVAPORATION REDUCTION FROM SOIL WITH WHEAT, SORGHUM, AND COTTON RESIDUES,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 2D.
W77-05435

CONTRIBUTION OF SUBSURFACE FLOW FROM THE UPPER SLOPES OF FORESTED WATERSHEDS TO CHANNEL FLOW,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
R. S. Beasley.

Soil Science Society of America Journal, Vol. 40, No. 6, p 955-959, November-December 1976. 3 fig, 1 tab, 13 ref.

Descriptors: *Subsurface flow, *Forest watersheds, *Channel flow, *Watersheds(Basins), Soil moisture, Hydrology, Runoff, Rainfall-runoff relationships, Streamflow, Overland flow, Hydrography, Storm runoff.
Identifiers: *Runoff mechanics, *Runoff contributing areas, Storm hydrography, Forest hydrology.

Overland flow and subsurface flow from 0.054-and 0.089-ha plots on the upper slopes of forested watersheds were intercepted and measured in trenches located at the bases of the plots. Channel flow was measured in flumes at the watershed outlet; and intensity, duration, and amount of rainfall were measured by gages on the watersheds. Over a 3-year period, 115 storms produced little overland and subsurface flow above the B-horizon. Subsurface flow over an impermeable clay layer was as much as 90% of rainfall during a calendar quarter. Thirty-six of the storms produced subsurface flow on one or both plots. For these storms, subsurface flow from the upper third of the watersheds was equivalent to 26% of the channel flow on one watershed and to 27% on the other. For 27 of the 36 storms, subsurface flow from the plots peaked sooner than channel flow. Twelve storms produced subsurface flow within 20 min of the onset of rainfall, and 15 storms produced channel flow within the same time. Subsurface flow often began shortly after rainfal began, even when there was neither saturation at the point of outflow nor high antecedent soil moisture. Interconnected channel through the soil formed by decayed roots and animal burrows are the best explanation for the quick subsurface flow responses. The similarity in timing of subsurface and channel flows indicates that subsurface flow from upper slopes can contribute significantly to storm hydrographs in forested areas where permeable surface soils overlie an impermeable stratum. (Lee-ISWS)
W77-05436

TOWARDS A ROUTINE TEST FOR THE ASSESSMENT OF THE CRITICAL TRACTIVE FORCES OF COHESIVE SOILS,
Western Australia Univ., Nedlands. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-05440

SHALLOW SUBSURFACE DRAINAGE-FIELD PERFORMANCE,
Agricultural Research Service, Columbus, Ohio. North Central Region.
For primary bibliographic entry see Field 4A.
W77-05441

DETERMINING SOIL WATER DIFFUSIVITIES FROM ONE-STEP OUTFLOW EXPERIMENTS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
J. B. Passioura.
Australian Journal of Soil Research, Vol. 15, No. 1, p. 1-8, March 1977. 6 fig., 5 ref.

Descriptors: *Diffusivity, *Laboratory tests, Measurement, Soil water movement, Soil moisture, Moisture content, Porous media.

Current methods of determining the diffusivity, D(theta), from one-step outflow experiments present a choice between accuracy and complexity on the one hand and convenience and propensity to error on the other. A method has been developed which is both relatively simple and relatively accurate, based on the assumption that the rate of change of volumetric water content over time, d(theta)/dt, is constant throughout the draining column of soil at any time. The method is accurate to within about 15 per cent over most of the range of theta during the outflow, providing that D increases monotonically with theta throughout the range. Theory, validation, and procedure are presented in detail. (CSIRO)
W77-05531

GRAVITY DRAINAGE OF A SAND PROFILE UNDER A TIME-DEPENDENT SURFACE FLUX,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-05532

A METHOD FOR COMPUTING AND COMPARING UPWARD FLOW OF WATER IN SOILS FROM A WATER TABLE USING THE FLUX/UNSATURATED CONDUCTIVITY RATIO,
Tasmania Univ., Hobart (Australia). Dept. of Agriculture.
N. S. Jayawardane.
Australian Journal of Soil Research, Vol. 15, No. 1, p. 17-25, March 1977. 2 fig, 7 ref.

Descriptors: *Soil water movement, *Pressure head, *Hydraulic conductivity, *Unsaturated flow, *Water table, Mathematical studies, Water pressure, Methodology.

A new method, based on an analysis of the unsaturated conductivity (k) - pressure head (h) curves in relation to their use in the flow equation, is proposed for the study of steady-state upward flow of water in soils from a water table and for the computation of the pressure-head profiles. This method utilises the flux/hydraulic conductivity ratio to provide a simplified but accurate means of computing pressure head profiles, using an algebraic equation for a given rate of upward flow, between specific values of pressure heads. The values of the parameters to be used in solving this equation can be read directly from the k-h curves. In many soils, upward flow can be characterised by two parameters, the slope of the k-h curve and the upper limit of the critical pressure head range, thus giving a basis for direct comparison. This method can be applied to k-h curves with any integer or non-integer value of slope. Equations are also derived from which the maximum depth to water table for any rate of upward flow can be read directly from the k-h curves of certain soils. The flux/unsaturated conductivity ratio is also used to define the critical range of unsaturated conductivity, and the corresponding critical pressure head range within which the absolute values of conductivity significantly affect the shape of the pressure head profile. The use of the flux/unsaturated conductivity method, and the critical ranges for analysing k-h curves in order to predict and compare upward flow in homogeneous and layered soils, are discussed. (CSIRO)
W77-05533

INFLUENCE OF SOIL BULK DENSITY ON HORIZONTAL WATER INFILTRATION,
Indian Agricultural Research Inst., New Delhi. Div. of Agricultural Physics.
A. K. Sharda.
Australian Journal of Soil Research, Vol. 15, No. 1, p. 83 - 86 March 1977. 1 fig, 3 tab, 2 ref.

Descriptors: *Infiltration, *Bulk density, *Soil density, *Soil water movement, Diffusivity, Moisture content.
Identifiers: *Soil bulk density.

Studies were conducted on soil columns of a silty clay loam packed at bulk densities of 1200, 1300 and 1400 kg/cu m to evaluate the influence of soil bulk density on water infiltration in the horizontal direction. Soil water diffusivities were reduced to less than 25 per cent near saturation with the increase in bulk density, but the influence of bulk density decreased with decreasing relative water content. Lengths of infiltration, cumulative influx and infiltration rate were also reduced markedly by the increase in bulk density. (CSIRO)
W77-05535

2H. Lakes

SALT COMPOSITION OF WATER FROM THE WESTERN (KURTLI) RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Botaniki.
N. V. Kostenko.
Izv Akad Nauk Turkm SSR Ser Biol Nauk. 3, p 28-33, 1974.

Descriptors: *Salts, Reservoirs, *Saline water, *Mineralogy, Phytoplankton, Canals, Water chemistry.
Identifiers: Macrophytes, *Turkmen-SSR, *USSR(Kara Kum Canal).

The mineralization rate of water in the upper sections of the reservoir is almost the same as in the Kara Kum Canal (Turkmen SSR, USSR). In the stands of submerged macrophytes the mineralization rate exceeds that in clear reaches. Disappearance of macrophytes increased the mineralization rate from 1078.2-1129 mg/l (Aug.-Sept.). Phytoplankton are also discussed.--Copyright 1975, Biological Abstracts, Inc.
W77-05101

THE EFFECT OF WATER TEMPERATURE ON ECOLOGICAL PROCESSES IN A RESERVOIR RECEIVING HEATED WATER,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-05108

A DATA INTEGRATION STUDY OF LAKE ONRARIA FOR THE EPISODE JULY 19 - AUGUST 2, 1972, PART I,
Northwestern Univ., Evanston, Ill. Technological Inst.
G. E. Birchfield, and A. T. Lunde.
Report to NOAA Great Lakes Environmental Research Laboratory, May 1976. 60 p, 2 tab, 4 ref, 2 append. NOAA 04-4-022-37.

Descriptors: *Coasts, *Lakes, *Water circulation, Graphical methods, Mathematical models, *Lake Ontario, Data collections, *Data processing, Great Lakes.
Identifiers: *Wind stress, *Graphical displays, Oceanographic data, Limnological data.

A detailed description is given of the procedures used in construction of integrated graphical displays of coastal transport, currents, temperature, lake level and wind stress for a 15 day episode on Lake Ontario in the summer of 1972. The graphical displays are analyzed in detail to give a synoptic description of the lake response during the episode. The purpose of the study is to explore through a global analysis of the coastal and larger scale flow the response of the lake to a series of wind stress impulses, determine the usefulness of integrated displays for such analysis, and to provide data for verification of numerical models of the lake circulation. (See also W77-05126) (NOAA)
W77-05125

A DATA INTEGRATION STUDY OF LAKE ONTARIO FOR THE EPISODE JULY 19 - AUGUST 2, 1972. PART II,
Northwestern Univ., Evanston, Ill. Technological Inst.
G. E. Birchfield, and A. T. Lunde.
Report to NOAA Great Lakes Environmental Research Laboratory, May 1976. 237 p. NOAA 04-4-022-37.

Descriptors: *Coasts, *Lakes, *Water circulation, Graphical methods, Mathematical models, Lake Ontario, Data collections, Data processing, Great Lakes.
Identifiers: *Wind stress, Oceanographic data, Limnological data, *Graphical displays.

This second part of the study contains the integrated graphical displays and tabulated data of coastal transport, currents, temperature, lake level and wind stress for a 15 day episode (July 19 - August 2 1972) on Lake Ontario (See also W77-05125) (NOAA)
W77-05126

HYDRODYNAMICS OF LARGE LAKES,
Woods Hole Oceanographic Institution, Mass.
G. T. Csanady.
Annual Review of Fluid Mechanics, Vol 7, p 357-385, 1975. 11 fig, 27 ref. NOAA 3-35142.

Descriptors: *Density stratification, *Hydrodynamics, *Lakes, *Thermocline, Circulation.
Identifiers: Coastal jets, Kelvin waves, Topographic gyres.

A discussion of hydrodynamic phenomena involving density stratification which occur in large lakes is given. Subjects considered are: Poincare waves on the thermocline; coastal jets and Kelvin waves; and topographic gyres. (NOAA)
W77-05127

LAKE ONTARIO ICE MODELING IFYGL, PHASE 3, FINAL REPORT,
General Electric Co., Philadelphia, Pa. Re-Entry and Environmental Systems Div.
For primary bibliographic entry see Field 2C.
W77-05128

ICE GROWTH IN DULUTH-SUPERIOR HARBOR,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 2C.
W77-05129

RADAR-GAGE PRECIPITATION MEASUREMENTS DURING THE IFYGL,
Center for the Environment and Man, Inc., Hartford, Conn.
J. W. Wilson.
CEM Report 4177-540, November 1975. 141 p, 24 fig, 10 tab, 28 ref. NOAA 03-5-022-17.

Descriptors: *Lake Ontario, Lake Erie, Precipitation(Atmospheric), Lakes, Meteorological data, Rain gages, *Radar, Data collections, Measurement, Great Lakes.
Identifiers: *Weather radars.

Daily precipitation values were prepared for Lake Ontario and its watershed for the period of the International Field Year for the Great Lakes (April 1972 - March 1973). The precipitation measurements were based on data from 167 rain gages and two weather radars. During the warm season it is estimated the daily values for the watershed have an average error of less than 10% those for the lake are estimated to be two to three times greater. Error figures for the winter are more uncertain, however. It is estimated the watershed values average 12% low and the lake values 7% low. This is primarily because of the undercatch of gages during snow. During the warm season the lake received 7% less train than the land areas immediately surrounding the lake. During the cold season two precipitation maximums were observed directly associated with the lake: one extending toward the northeast originating over lake Erie and another extending east originating over Lake Ontario. The success of the IFYGL precipitation task demonstrates that radar and gage data can be combined to provide improved precipitation analyses for a wide variety of situations. (NOAA)
W77-05130

CONTROL OF MESOSCALE DISTURBANCE BY SYNOPTIC CONDITIONS,
Rosenstiel School of Marine and Atmospheric Science, Coral Gables, Fla.
J. Gross, and M. A. Estogue.
Annual Report to NOAA Great Lakes Environmental Research Laboratory, October 1975. 36 p, 17 fig, 13 ref. 04-4-158-25.

Descriptors: *Air-water interfaces, *Lake Ontario, Great Lakes, Mathematical models, Meteorological data, Hydrologic data, Data collections.
Identifiers: *Atmospheric disturbances, *Mesoscale disturbances, *Synoptic conditions.

Research dealing with the problem of how synoptic conditions control the growth of mesocale disturbances is described. These disturbances, associated with the Great Lakes, arrise principally from physical processes which occur at the air-lake interface. Prevailing synoptic conditions govern the intensity of these processes. Thus, while these particular phenomena have their origins in interface processes, the synoptic situation controls the final state of development of the disturbance. This problem is approached in two ways; development of a three-dimensional numerical model in order to study theoretically the interaction between synoptic conditions and mesocale disturbances; an analysis of observational data to verify deductions from the numerical model. (NOAA)
W77-05138

A NOTE ON THE SYNCHRONISM OF HIGHLY CORRELATED LAKES,
Consiglio Nazionale delle Ricerche, Milan (Italy). Centro di Teoria dei Sistemi.
A. Colorni, S. Rinaldi, and P. Romano.
Journal of Hydrology, Vol. 32, No. 1/2, p 49-56, January 1977. 1 fig, 2 tab, 2 ref.

Descriptors: *Lakes, Europe, *Model studies, Lake stages, Inflow, Hydrology, Statistical methods, Statistical models, Foreign countries, Foreign research, Equations.
Identifiers: *Synchronism(Lakes), *Italy(Brianza region), Highly correlated lakes.

The phenomenon of the synchronism of two nearby lakes was analyzed by means of a simplified linear model which described the dynamic behavior of the lakes. The coefficient and the degree of synchronism of two lakes were defined, and simple expressions were proposed for their estimates. The analysis of the dynamic behavior of four lakes of the Brianza region in Italy allowed validation of the theory developed here and showed how the degree of synchronism is affected by some basic factors. Finally, a simple application was discussed briefly, where the law of synchronism is employed to reconstruct some missing data that allows the estimation of the discharge curve of a lake. (Lee - ISWS)
W77-05142

LOW-FREQUENCY TURBULENCE SPECTRA IN THE MIXED LAYER OF LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Div. of Environmental Studies; and California Univ., Davis. Dept. of Physics.
T. M. Dillon, and T. M. Powell.
Journal of Geophysical Research, Vol 81, No 36, p 6421-6427, December 20, 1976. 7 fig, 1 tab, 41 ref. NSF GA-34099, DES75-14370.

Descriptors: *Turbulence, *Epilimnion, *Lakes, *California, *Nevada, Current meters, On-site investigations, Waves(Water), Energy, Energy dissipation, Thermocline, Mixing, Temperature, Water temperature, Measurement, Data processing, Limnology.
Identifiers: *Lake Tahoe(Calif-Nev), Kinetic energy, *Low-frequency turbulence.

Low-frequency turbulence was measured in the unstratified mixed layer (epilimnion) of Lake Tahoe, California-Nevada, during August and September 1973 by using savonius rotor current meters positioned at three depths. Kinetic energy frequency spectra derived from these measurements were compared with the Kolmogorov inertial subrange prediction by assuming that Taylor's hypothesis is valid. The spectra are proportional to (wave number) to the (-5/3) power in a wavelength range generally between 10 m and 100 m at all depths. In view of the shallow thermocline depth (18-27m), the turbulence cannot be considered isotropic in this wavelength range, and a true inertial subrange should not exist. Kinetic energy dissipation rates averged over the epilimnion were calculated from the -5/3 portion of the kinetic energy spectra and vary between 0.0004 sq cm/s to the 3rd power (with slight winds) to 0.005 sq cm/s to the 3rd power (with winds ranging from 2 to 8 m/s). These dissipation rates are comparable with dissipation rates measured at similar depths in oceanic waters. (Sims-ISWS)
W77-05155

FATE 2,4,5-T CONTAMINANT, 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD) IN AQUATIC ENVIRONMENTS,
Wisconsin Univ., Madison. Dept. of Entomology.
For primary bibliographic entry see Field 5A.
W77-05170

THE EFFECTS OF DIURNAL MIXING ON THERMAL STRATIFICATION OF STATIC IMPOUNDMENTS,
Arizona State Univ., Tempe. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 4A.
W77-05172

THE SIGNIFICANCE OF GRAVEL PITS AS A BIOLOGICAL REFUGE, (IN GERMAN),
K. Escher.
Viertel Jahrsschr Naturforsch Ges Zur 119(4), p 345-348, 1974.

Descriptors: Gravels, *Aquatic animals, *Aquatic plants, Frogs, Mollusks, Salamander, Dragonflies, Ponds, *Ecology, *Biology.
Identifiers: *Gravel pits, Midwife toad, Polyps, Reeds.

In increasing industrialized central Europe (Switzerland), empty gravel pits often become valuable wildlife preserves when the bottom fills with water. Vegetation (reeds and other water plants) and large variety of animals (toads, frogs, dragonflies, water bugs, mollusks and polyps) settle in them. The midwife toad and the rare crested salamander, as well as the more common amphibians were found more often in such gravel pits than in meadows and along brooks. This natural use of abandoned gravel pits should be carefully considered before a decision is made to fill the pit with refuse and restore the natural continuity of the terrain.--Copyright 1976, Biological Abstracts, Inc.
W77-05205

SEDIMENTATION IN THE LAKE OF TUNIS: A LAGOON STRONGLY INFLUENCED BY MAN,
Duke Univ., Durham, N.C. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-05206

MODIFICATION OF COASTAL WETLANDS IN SOUTHEASTERN MICHIGAN AND MANAGEMENT ALTERNATIVES,
Eastern Michigan Univ., Yipsilanti.

For primary bibliographic entry see Field 4A.
W77-05217

THE USE OF OXYGEN DEFICIT MEASUREMENTS AS AN INDEX OF EUTROPHICATION IN TEMPERATE DIMICTIC LAKES,
For primary bibliographic entry see Field 5C.
W77-05222

ANNUAL BENTHIC BIOMASS DISTRIBUTION IN A HIGH-MOUNTAIN LAKE (VORDERER FINSTERTALER SEE, TYROL, AUSTRIA),
For primary bibliographic entry see Field 5C.
W77-05223

STABILITY OF THE OXYGEN STRATIFICATION IN A EUTROPHIC LAKE,
For primary bibliographic entry see Field 5C.
W77-05224

DYNAMIC OF NUTRIENT LIMITATIONS IN SIX SMALL LAKES,
For primary bibliographic entry see Field 5C.
W77-05225

BACTERIAL DISTRIBUTIONS IN LAKE ERIE (1967, 1970),
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-05227

THE FISH COMMUNITY IN LAKE ERIE,
Lake Erie Fisheries Research Station, Wheatley (Ontario).
For primary bibliographic entry see Field 5C.
W77-05229

SEDIMENT STUDY, LAKE GEORGE, NEW YORK: TRACE METALS (FE, MN, CU, CR, ZN) ORGANIC CARBON, MAN'S ACTIVITIES,
Giessen Univ. (West Germany). Dept. of Geology.
For primary bibliographic entry see Field 5C.
W77-05231

SEASONAL DISTRIBUTION AND ABUNDANCE OF CRUSTACEAN ZOOPLANKTON IN LAKE ERIE, 1970.
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-05233

RELATIONSHIPS OF PHYTOPLANKTON BIOMASS WITH SOLUBLE NUTRIENTS, PRIMARY PRODUCTION, AND CHLOROPHYLL A IN LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-05235

A STOCHASTIC POINT-PROCESS MODEL FOR THE OCCURRENCE OF MAJOR FREEZES IN LAKE CONSTANCE,
Byk Gulden Research Centre, Konstanz (West Germany).
For primary bibliographic entry see Field 2C.
W77-05242

WATER-QUALITY CHARACTERISTICS OF SIX SMALL LAKES IN MISSOURI,
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-05259

A GUIDE FOR THE GEOLOGIC AND HYDROLOGIC EVALUATION OF SMALL LAKES SITES IN MISSOURI,
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 8D.
W77-05260

LAKES OF OREGON: VOLUME 4. CLACKAMAS COUNTY,
Geological Survey, Portland, Oreg. Water Resources Div.
M. V. Shulters.
Open-file report, 1976. 76 p, 4 fig, 2 tab, 19 ref.

Descriptors: *Lakes, *Water quality, *Lake morphology, *Lake morphometry, *Oregon, Bathymetry, Thermal stratification, Fish, Chemical analysis, Dissolved oxygen, Water temperature.
Identifiers: Clackamas County(Oreg).

This report provides information for use by city, county, and State planning groups as well as for sportsmen, tourists, and others interested in preserving the recreational value of Oregon's lakes. The lake information is being issued in several volumes on a county or multicounty basis. Clackamas County was selected for volume 4. In addition to office compilation of existing data, each lake was visited. Most visits were made in summer or early fall when lakes were most accessible and when water temperature and biological activity were near maximum. (See also W76-01579, W75-03968, and W74-06270) (Woodard-USGS)
W77-05283

INLAND LAKES WATER QUALITY AND WATERSHED PLANNING: REMOTE SENSING TECHNOLOGY APPLICATIONS,
Michigan Environmental Research Inst., Ann Arbor.
For primary bibliographic entry see Field 6B.
W77-05297

CHARACTERISTICS OF THE PELAGIC ENVIRONMENT OF THE BRACKISH-WATER LAGOONS OF BAGES-SIGEAN AND SALSES-LEUCATE DURING THE SUMMER OF 1974, (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
For primary bibliographic entry see Field 5C.
W77-05304

THE ROLE OF ZOOPLANKTON IN THE INTRABIOCOENOTIC PHOSPHORUS CYCLE AND FACTORS AFFECTING PHOSPHORUS EXCRETION IN A LAKE,
New Hampshire Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-05312

THE CHARACTERIZATION OF PHOSPHORUS EXCRETION PRODUCTS OF A NATURAL POPULATION OF LIMNETIC ZOOPLANKTON,
New Hampshire Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-05313

A CHEMICAL INVESTIGATION OF PHOSPHORUS REMOVAL IN LAKES BY ALUMINUM HYDROXIDE,
Wisconsin Univ.-Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5G.
W77-05367

THE LAKE OF STARNBERG AND THE MANAGEMENT OF ITS COREGONID POPULATION WITH RESPECT TO ITS TROPHIC STATE, (IN GERMAN),
Bayerische Landesanstalt fuer Fischerei, Starnberg (West Germany).
For primary bibliographic entry see Field 5C.
W77-05414

A STUDY OF GLACIER-DAMMED LAKES OVER 75 YEARS, BRIMKJELEN, SOUTHERN NORWAY,
Portsmouth Polytechnic (England). Dept. of Geography.
D. N. Mottershead, and R. L. Collin.
Journal of Glaciology, Vol. 17, No. 77, p 491-505, 1976. 8 fig, 4 tab, 15 ref.

Descriptors: *Glaciers, *Lake morphology, *Lakes, *Drainage, Ice, Shape, Dams, Foreign countries, On-site investigations, Surveys, Evaluation, Analysis, Terrain analysis, Floods, Fluctuations, Aerial photography.
Identifiers: *Norway, Glacier dammed lakes.

Evidence was brought together concerning the deglaciation of a small valley and the subsequent development of it of periodic glacier-dammed lakes. The respective volumes and drainage dates of the lakes were evaluated, and an attempt was made to relate these to the down-wastage of the impounding glacier. The general pattern of lakes throughout the years, as far as it is possible to deduce the pattern from available evidence, is as follows: Conditions conducive to the collection of water first occurred in 1896, and during the subsequent decade at least, this water was ponded up by Tunsbergdalsbreen subglacially beneath the Brimkjel glacier. As the glacier receded, an open lake formed. It appears that it was during this phase that the greatest lakes formed, as evidenced by the data for 1926 and 1937. Subsequently, as the ice dam of Tunsbergdalsbreen has receded and lowered, the lakes have been of much lower magnitude; although, in all cases except the brief August 1973 lake, they were larger than Rekstad's estimate for 1900. At least two of the open lakes extended up on to the surface of the impounding Tunsbergdalsbre. Calculation of the depth of water impounded in the lakes of 1937, 1957, 1962, 1966, and 1973 (spring) showed that the head of water has been remarkably constant over the years. This suggests that once a given pressure is attained at the foot, then a breach in the ice dam is formed and the lake begins to drain. There is evidence for flotation of the Tunsbergdalsbre ice to allow subglacial seepage, and (in other years) there is also evidence of tunnel formation. The actual mechanism of breaching may differ, therefore, from year to year. (Humphreys-ISWS)
W77-05427

RESERVOIR BASIN MORPHOMETRY,
Victoria-New South Wales Rivers and Water Supply Commission (Australia).
For primary bibliographic entry see Field 4A.
W77-05447

VELOCITY OF SOUND IN SEDIMENTS CORED FROM SOUTHERN LAKE MICHIGAN,
Illinois Univ., Chicago. Dept. of Materials Engineering.
M. L. Silver, and J. A. Lineback.
Illinois State Geological Survey Circular 475, p 1-18, 1972. 10 fig, 1 tab, 13 ref.

Descriptors: *Sediments, *Sounds, *Velocity, *Lake Michigan, Seismic studies, Acoustics, Pleistocene epoch, Measurement, Bottom sediments, *Lake sediments, Bottom sampling, Sampling.
Identifiers: *Time of travel(Sediments).

Measurements of the velocity of sound were made on lake bottom samples obtained by gravity coring in southern Lake Michigan during July 1971. Measurements were made at several stations with a

specially designed device that measures the travel time of acoustic waves while the sediment is fresh from the lake floor, still enclosed in a plastic liner. The velocity of sound in the lake bottom water was determined to be near 1428 meters per second. The velocity of sound in the sediments ranges from 1348 to 1550 meters per second, slower and faster than the velocity in water. The velocity clearly corresponds to sediment type. Velocities in the soft silts and clays of the Lake Michigan Formation range from 1348 to 1488 meters per second. In the relatively dense, glacial-lacustrine clay of the Equality Formation, the velocities range from 1360 to 1529 meters per second. The highest velocity, about 1550 meters per second, was noted in an unnamed compact glacial till unit. (Bhowmik-ISWS)
W77-05451

DISTRIBUTION OF BENTHIC MACROINVERTEBRATES IN AN ARTIFICIALLY DESTRATIFIED RESERVOIR,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W77-05485

COMPONENT COMPOSITION AND TRANSFORMATION AND WATERSOLUBLE ORGANIC SUBSTANCE IN BOTTOM SOILS OF THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5B.
W77-05492

GROWTH OF SALMONID FISHES FROM HEATED AND UNHEATED AREAS OF LAKE MICHIGAN-MEASURED BY RNA-DNA RATIOS,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W77-05554

THERMAL EFFLUENTS, FISH, AND GAS-BUBBLE DISEASE IN SOUTHWESTERN LAKE MICHIGAN,
Industrial Bio-Test Lab., Inc., Northbrook, Ill.
For primary bibliographic entry see Field 5C.
W77-05558

THERMAL ECOLOGY OF PHYTOPLANKTON IN A DESERT RESERVOIR,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W77-05573

EFFECTS OF A THERMAL EFFLUENT ON THE OSTRACODS OF PAR POND, SOUTH CAROLINA,
Rhode Island Univ., Kingston. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-05576

THE MACROBENTHIC COMMUNITY OF A THERMALLY ALTERED AREA OF TAMPA BAY, FLORIDA,
University of South Florida, St. Petersburg. Dept. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-05585

THE INCIDENCE AND EFFECT OF ONCE-THROUGH COOLING ON YOUNG-OF-THE-YEAR FISHES AT LONG POINT BAY, LAKE ERIE: A PRELIMINARY ASSESSMENT,
Ontario Ministry of Natural Resources, Port Dover.
For primary bibliographic entry see Field 5C.
W77-05597

2I. Water In Plants

SOIL WATER AVAILABILITY IN AN ARIZONA MIXED CONIFER CLEARCUTTING.
Rocky Mountain Forest and Range Experiment Station, Flagstaff, Ariz.
For primary bibliographic entry see Field 4D.
W77-05121

SUSPENDED SEDIMENT FILTRATION CAPACITY OF SIMULATED VEGETATION,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W77-05184

VEGETATION INFORMATION FOR COASTAL GEORGIA,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 2L.
W77-05399

2J. Erosion and Sedimentation

ANALYSIS OF REHABILITATION TREATMENT ALTERNATIVES FOR SEDIMENT CONTROL,
Pacific Southwest Forest and Range Experiment Station, Berkley, Calif.
For primary bibliographic entry see Field 4D.
W77-05116

AN EXAMINATION OF THE VARIANCE MINIMIZATION TENDENCIES OF A SUPRAGLACIAL STREAM,
California Univ., Santa Barbara, Dept. of Geography.
For primary bibliographic entry see Field 2E.
W77-05141

SUSPENDED SEDIMENT FILTRATION CAPACITY OF SIMULATED VEGETATION,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
E. W. Tollner, B. J. Barfield, C. T. Haan, and T. Y. Kao.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 4, p 678-682, July-August 1976. 5 fig, 2 tab, 15 ref. OWRT A-049-KY(2).

Descriptors: *Model studies, *Suspended solids, *Sediments, *Filtration, *Vegetation, Simulation analysis, Mannings equation, Laboratory tests, Settling velocity, Trap efficiency, Equations.
Identifiers: *Vegetal filter, *Non-submerged flow, *Suspended sediment.

An exponential power function relating the fraction of sediment in a simulated rigid vegetal media to pertinent physical variable was developed using linear regression techniques and various transformations. Homogeneous sediments and nonsubmerging flows were studied. The mean velocity was found to be the most influential parameter on sediment trapping followed by the flow depth, particle fall velocity, section length, and spacing hydraulic radius. The spacing hydraulic radius is a combintion of the distance between two media elements and depth of flow and is analogous to the hydraulic radius of an open rectangular channel. This term was observed to be a reasonably good predictor of the length scale in shallow flows through the experimental media. An equation similar in form to Manning's equation utilizing the spacing hydraulic radius was observed to be a good predictor of the mean flow velocity. (Bhowmik-ISWS)
W77-05184

DETERMINATION OF TOTAL MERCURY IN SOILS AND SEDIMENTS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W77-05201

SEDIMENTATION IN THE LAKE OF TUNIS: A LAGOON STRONGLY INFLUENCED BY MAN,
Duke Univ., Durham, N.C. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-05206

CHANGE OF ORGANIC SUBSTANCES IN VIRGIN AND ARABLE CINNAMONIC CALCAREOUS MOUNTAIN SOILS DEPENDING ON THE DEGREE OF THEIR EROSION, (IN RUSSIAN),
Yu. Akramov, and I. Ikramova.
Izv Akad Nauk Tadzh SSR Otd Biol Nauk 1, p 73-77. 1975.

Descriptors: *Organic matter, *Alfalfa, *Soil erosion, Humus, *Calcareous soils, Cultivation, Crop production.
Identifiers: *USSR(Tadzhik SSR).

A study of organic substances of virgin lands, old arable fields and alfalfa sods in uneroded, eroded and alluviated cinnamonic calcareous mountain soils of the Tadzhik SSR (USSR) revealed that in uneroded soils the stock of root remains and humus was 198.6 on virgin land, 122.6 on old aerable fields and 143 tons/ha; in alluviated soils, 226.9, 144.0 and 171.0 tons/ha. As as result of growing alfalfa the total stock of humus and N in the soils increased in comparison with old aerable soil. Cultivation of alfalfa increased the biological activity of eroded soil.--Copyright 1976, Biological Abstracts, Inc.
W77-05220

SEDIMENT STUDY, LAKE GEORGE, NEW YORK: TRACE METALS (FE, MN, CU, CR, ZN) ORGANIC CARBON, MAN'S ACTIVITIES,
Giessen Univ. (West Germany). Dept. of Geology.
For primary bibliographic entry see Field 5C.
W77-05231

EFFECT OF PORE WATER PRESSURE ON SAND SPLASH,
Agricultural Research Service, Morris, Minn.
L. L. Sloneker, T. C. Olson, and W. C. Moldenhauer.
Soil Science Society of America Journal, Vol. 40, No. 6, p 948-951, November-December 1976. 5 fig, 3 tab, 8 ref.

Descriptors: *Pore water, *Pore pressure, *Erosion, Tension, Tensiometers, Raindrops, Soil erosion, Laboratory tests, Soils, Sands, Energy, Erosion rates, Soil science.
Identifiers: *Sand splash, *Pore water pressure, Soil detachment.

The study examined the effect of pore water pressure and particle size distributions on the amount of sand splash and on the instantaneous pressure changes within a packed sand core caused by single water drops falling on the surface. Both splash amounts and pore water pressure changes were affected by particle size, by pore water pressure before drop impact, and by the direction of approach to the pore water pressure equilibrium. Pore water pressure increases from falling water drops were generally greater when equilibrium pressures were approached directly than when they were approached from minimum pressure. Sand splash was also generally greater when equilibrium pressure was approached directly. (Sims-ISWS)
W77-05354

APPLICATION OF FLOW-SEDIMENT MODEL TO RED RIVER,
Army Engineer District, Vicksburg, Miss.
P. G. Combs, W. A. Thomas, and E. P. Russo.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No. HY1, Proceedings Paper 12676, p 11-18, January 1977. 7 fig, 3 ref, 1 append.

Descriptors: *Flow, *Sediments, *Mathematical models, *Scour, *Deposition(Sediments), Sedimentation, Locks, Dams, Flood control, Rivers, *Computer models, *Sediment transport, *Louisiana.
Identifiers: *Red River(La), *Channel stabilization.

A method of computing sediment transport throughout a reach of river was presented. More specifically, a method to determine areas of scour and deposition along the river and to identify tendencies of a rating curve to shift due to sediment movement was analyzed. The computer model was applied to the Red River. The model reproduced observed flow profiles, stage discharge, and the sediment rating curve. The program was rerun to predict the effects of the installation of several locks and dams in the river. This gave predictions for primary areas of scour and deposition for 5-yr and 50-yr periods, thus providing an estimate of the required maintenance dredging. The model also allowed for a study of the effects of a hinge pool operation. It was concluded that this type of operation is only a temporary solution to the sedimentation problem. (Bhowmik-ISWS)
W77-05357

COMPUTER PREDICTION OF NEARSHORE AND SURF ZONE STATISTICS,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 2L.
W77-05385

THE BENTHIC FAUNA AND SEDIMENTS OF THE NEARSHORE ZONE OFF PANAMA CITY BEACH, FLORIDA,
National Marine Fisheries Service, Panama City, Fla. Panama City Lab.
For primary bibliographic entry see Field 2L.
W77-05386

GRAIN SHAPE AND SIZE DISTRIBUTION EFFECTS IN COASTAL MODELS,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 2L.
W77-05389

THE VALUE AND VULNERABILITY OF COASTAL RESOURCES: BACKGROUND PAPERS FOR REVIEW AND DISCUSSION.
Georgia Dept. of Natural Resources, Atlanta, Resource Planning Section.
For primary bibliographic entry see Field 2L.
W77-05390

THE VALUE AND VULNERABILITY OF COASTAL BEACHES, SAND DUNES, AND OFFSHORE SAND BARS,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 2L.
W77-05392

TERRESTRIAL ECOLOGY OF THE GEORGIA BARRIER ISLANDS,
Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W77-05393

THE OPEN MARINE AND ESTUARINE WATERS,
National Park Service, Atlanta, Ga.
For primary bibliographic entry see Field 2L.
W77-05401

COASTAL SAND DUNES,
North Carolina State Univ., Raleigh. Dept. of Botany; and North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2L.
W77-05405

PREDICTING PARTICLE-SIZE COMPOSITION OF ERODED SOIL,
Agricultural Research Service, Morris, Minn. North Central Region.
R. A. Young, and C. A. Onstad.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 6, p 1071-1075, November-December 1976. 2 fig, 3 tab, 22 ref.

Descriptors: *Particle size, *Soils, *Soil erosion, Rill erosion, Suspended solids, Sediments, Erosion, Chemicals, Agricultural chemicals, Organic matter, Clays, Silts, Model studies, Mathematical models, Forecasting, Agricultural runoff, Agriculture, Soil science.
Identifiers: *Eroded soil.

Chemicals are transported in an agricultural environment by the movement of water and soil. To select management practices that will minimize the undesirable movement of agricultural chemials through a field or a watershed, it is necessary to understand the mechanisms by which these chemicals are transported. Concerning soil, knowledge of the composition and particle-size distribution of eroded material is needed for sediment-chemistry relations, since the physical adsorption of chemicals depends on the soil's specific surface area. A set of equations was developed for predicting particle-size distribution of eroded soil, based on soil surface area and texture and considering organic matter enrichment and the tendency of a soil to rill. Three parameters, particle-size distribution of the matrix soil, organic matter, and water content at -15 bars pore pressure, gave a good estimate of the expected particle-size distribution. (Sims-ISWS)
W77-05439

TOWARDS A ROUTINE TEST FOR THE ASSESSMENT OF THE CRITICAL TRACTIVE FORCES OF COHESIVE SOILS,
Western Australia Univ., Nedlands. Dept. of Civil Engineering.
M. Hollick.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 6, p 1076-1081, November-December 1976. 4 fig, 1 tab, 27 ref.

Descriptors: *Tractive forces, *Soil erosion, *Laboratory tests, *Cohesive soils, Laboratory equipment, Scour, Erosion, Jets, Soils, Cohesion, Erosion rates, Soil science.

An attempt to calibrate a submerged water jet apparatus against critical tractive forces visually assessed in a flume was described. Athough not completely successful, the work indicated that the water jet might suitable for routine laboratory measurement of critical tractive force, and suggestions were made for the improvement of the calibration. It was pointed out that the gradient of the erosion rate vs. shear stress curve may be important in channel design, as well as the critical tractive force. The conclusion was drawn that accelerated laboratory tests cannot be used to assess critical tractive forces. (Sims-ISWS)
W77-05440

WAVE ENTRAINMENT OF SEDIMENT FROM RIPPLED BEDS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. Nakato, F. A. Locher, J. R. Glover, and J. F. Kennedy.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW1, Proceedings Paper 12736, p 83-99, February 1977. 12 fig, 3 tab, 16 ref, 1 append. Army DACW-72-73-C-0022.

Descriptors: *Sediments, *Entrainment, *Sediment transport, *Model studies, *Hydraulic models, Beds, Ripple marks, Suspended solids, Waves(Water), Velocity, Laboratory tests, Measurement, Oceans, Coasts, Sedimentology, Oceanography.
Identifiers: *Rippled beds, Bed forms, Water tunnels.

An experimental investigation was conducted with an oscillatory flow water tunnel to explain the mechanism of sediment entrainment by periodic fluid motion past rippled beds. The instrumentation used included an optical-type sediment concentration analyzer, a hot-wire anemometer, and an IBM 1801 Data Acquisition and Control System. The signal-averaging technique was used to analyze the data permitted decomposition of the concentration and velocity signals into mean, periodic, and random components. The process of sediment entrainment and suspension was explained in terms of flow separation from the ripple crest together with the flow reversal. Simultaneous measurement of temporal and spatial distributions of suspended sediment relationship and vertical fluid elocity in the region just gradient of the bed showed that the conventional one-dimensional continuity relationship for steady uniform flow is inadequate; the horizontal gradient of streamwise sediment flux is comparable in importance to the vertical gradient of vertical flux of sediment. (Sims-ISWS)
W77-05445

VELOCITY OF SOUND IN SEDIMENTS CORED FROM SOUTHERN LAKE MICHIGAN,
Illinois Univ., Chicago. Dept. of Materials Engineering.
For primary bibliographic entry see Field 2H.
W77-05451

2K. Chemical Processes

SALT COMPOSITION OF WATER FROM THE WESTERN (KURTLI) RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Botaniki.
For primary bibliographic entry see Field 2H.
W77-05101

ERRORS IN ATOMIC ABSORPTION ANALYSIS FOR METALS IN SURFACTANT SOLUTIONS,
Missouri Univ., Rolla. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-05110

AEROSOL IN THE GATE AREA AND ITS RADIATIVE PROPERTIES,
Leningrad State Univ. (USSR). Dept. of Atmospheric Physics.
K. Ya. Kondratyev, O. D. Barteneva, and L. I. Chapursky.
Colorado State University, Department of Atmospheric Science, Atmospheric Science Paper No. 247, June 1976. 120 p, 35 fig, 6 tab, 27 ref. Also as: Transactions of the Main Geophysical Observatory, Leningrad, Issue No 381. NOAA-C4-6-158-44036.

Descriptors: Air pollution, *Aerosols, *Dust, Clouds, Albedo, *Atmospheric radiation, Solar radiation, Meteorological data, *Atlantic Ocean, Metals, Chemical analysis, Arid lands, Tropical regions, Pollutant identification.
Identifiers: Sahara, GARP Atlantic Tropical Experiment(GATE).

Preliminary results are summarized of a research program conducted by Main Geophysical Observatory scientists during the GATE (GARP Atlantic Tropical Experiment). The origin and characteristic features of the dust layer are discussed. Inferences of microphysical and optical characteristics of the dust aerosol made from ship data are presented. Chemical analyses of aerosols showed a rather high content of metals. The iron concentration nearly always exceeded 10-5kg m-3 for aircraft aerosol observations. Extensive data are presented giving spectral and total short-wave radiative flux divergence values for cloudfree, dust and stratoform cloud cases. These data are interpreted in the context of the meteorological conditions and the optical parameters of the aerosol or cloud layer. (NOAA)
W77-05131

BORON IN COASTAL NORTH FLORIDA RAINFALL,
North Carolina Univ. at Chapel Hill. Marine Sciences Program; and North Carolina Univ. at Chapel Hill. Dept. of Geology.
C. S. Martens, and R. C. Harriss.
Journal of Geophysical Research, Vol. 81, No. 36, p 6371-6375, December 20, 1976. 2 fig, 3 tab, 21 ref.

Descriptors: *Boron, *Rainfall, *Water chemistry, *Florida, Sampling, Chemical analysis, Sodium, Summer, Winter, Hurricanes, Chemicals, Precipitation(Atmospheric), Sea water, Sea spray, Salts, Evaporation, Oceans, Pollutant identification.
Identifiers: Hurricane Becky.

Boron concentrations of coastal North Florida rainfall averaged 8.3, 12, and 7.0 micrograms/liter for summer showers, winter frontal activity, and samples collected sequentially during tropical storm Becky, respectively. B/Na ratios were 0.011 and 0.005 in summer and winter samples, respectively. Mean calculated B enrichments E sub Na(B) for summer and winter sample sets were 32 and 11, respectively. A surprisingly constant concentration of 'excess' B above that expected from direct sea water injection of approximately 6 micrograms/liter was observed in the sequential Becky samples. The lower winter B/Na ratios, and thus the calculated E sub Na(b) values, appear related to higher Na concentrations; however, several alternative hypotheses can be advanced to explain the results, including greater particulate sea-salt injection during winter months, incorporation of soil materials with a B/Na ratio above the sea water value, and possible influences of temperature variation on gaseous B incorporation in rain and evaporation from the sea surface. (Sims-ISWS)
W77-05152

HYDROCHEMICAL CHARACTERISTICS OF GROUND WATERS IN THE LOWLAND BETWEEN THE RIVERS TIMIS AND BEGA, (IN ROMANIAN),
Institutul de Studii si Gercetari Pedologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2F.
W77-05166

THE CHEMISTRY OF LEAD AND CADMIUM IN SOIL: SOLID PHASE FORMATION,
Utah State Univ., Logan. Dept. of Soil Science and Micrometeorology.
For primary bibliographic entry see Field 5B.
W77-05202

MAJOR CARBON 14 ANOMALY IN A REGIONAL CARBONATE AQUIFER: POSSIBLE EVIDENCE FOR MEGASCALE CHANNELING, SOUTH CENTRAL GREAT BASIN,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-05261

GUIDELINES FOR COLLECTION AND FIELD ANALYSIS OF GROUND-WATER SAMPLES FOR SELECTED UNSTABLE CONSTITUENTS,
Geological Survey, Austin, Tex. Water Resources Div.
W. W. Wood.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202, price $0.85. Geological Survey Techniques of Water-Resources Investigations, Book 1, Chapter D2, 1976. 24 p, 18 fig, 2 tab, 14 ref.

Descriptors: *Water analysis, *Groundwater, *Testing procedures, *Water quality, Sampling, Methodology, Analytical technique, On-site tests, Hydrogen ion concentration, Water temperature, Carbonates, Bicarbonates, Specific conductivity, Dissolved oxygen, Oxidation-reduction potential.

The unstable nature of many chemical and physical constituents in ground water requires special collection proceures and field analysis immediately after collection and field analysis of samples for pH, temperature, carbonate, bicarbonate, specific conductance, Eh, and dissolved oxygen. (Woodard-USGS)
W77-05262

GROUND-WATER DATA FOR LEFLORE COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05265

GROUND-WATER DATA FOR HUMPHREYS COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05266

GROUND-WATER DATA FOR ISSAQUENA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05267

GROUND-WATER DATA FOR QUITMAN COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05268

GROUND-WATER DATA FOR COAHOMA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05269

GROUND-WATER DATA FOR TATE COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05270

GROUND-WATER DATA FOR TUNICA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05271

PHASE RELATIONSHIPS IN SEA ICE AS A FUNCTION OF TEMPERATURE,
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 2C.
W77-05428

EFFECT OF SURFACTANTS ON THE DETERMINATION OF FLUORIDE IN WATERS,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
For primary bibliographic entry see Field 5A.
W77-05431

A SPECIFIC CONDUCTANCE METHOD FOR QUALITY CONTROL IN WATER ANALYSIS,
Lancaster Univ., Bailrigg (England). Dept. of Environmental Sciences.
D. P. H. Laxen.
Water Research, Vol. 11, No. 1, p 91-94, 1977. 1 fig, 4 tab, 11 ref.

Descriptors: *Conductivity, *Analytical techniques, *Quality control, *Specific conductivity, *Water analysis, Physical properties, Electrical conductance, Resistivity, Water properties, Chemical analysis, Instrumentation, On-site tests, Water quality, Dissolved solids, Analysis, Testing procedures, Potable water, Pollutant identification.
Identifiers: Ionic strength, Ionized species, Limestone catchments.

A method to aid quality control in water analysis was described. It can be used both to help maintain a high quality of analytical data and to highlight inconsistencies in existing data. The procedure, either computational or graphical, relies on a comparison of measured specific conductance, with a specific conductance calculated from the analytical data using an extended version of the Onsager limiting equation. The method was discussed in relation to water analyses typical of limestone catchments. A number of limitations were set forth. The method was shown to be suitable for most waters with a specific conductance in the range 80-350 microsiemens/cm, although it can probably be extended to waters with a specific conductance in the range 50-1000 microsiemens/cm. (Henley-ISWS)
W77-05453

2L. Estuaries

ATMOSPHERIC DISPERSION CHARACTERISTICS IN THE LOUISIANA COASTAL ZONE,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5A.
W77-05132

BARATARIA BASIN: HYDROLOGIC AND CLIMATOLOGIC PROCESSES,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
Sea Grant Publication No. LSU-T-76-010, June 1976. 187 p, 58 fig, 24 tab, 70 ref, 4 append.

Descriptors: *Louisiana, *Wetlands, *Hydrologic systems, *Climatology, Planning, Tides, Water levels, Salinity, Weather, Coasts, Gulf of Mexico.
Identifiers: *Barataria Basin(La), Coastal zone management.

To assess the role of forcing functions or respondents in the operation of natural systems within the Barataria Basin Management Unit, assessment included: descriptive physical aspects of tides and water levels, based on continuous recording gauging records; descriptive aspects of salinity, based on variety of recorded data; a synoptic climatic system, based on daily synoptic weather maps and three-hourly observational data at New Orleans;

and wave climate. A systematic description of long-term and short-term patterns of water levels, tides, salinity, temperature, and wave climate provide information on the historic and present physical aspects of Barataria Basin. Eight synoptic weather types provide the framework for analysis of the basin's weather by relating local climatic conditions to large-scale circulation patterns. A water budget is also utilized to estimate rates of evapotranspiration and generation of surplus precipitation. Relationships between pairs of parameters drawn from tides, water levels, and salinity at various resolutions are described. Relationships between climatic conditions associated with each synoptic weather type and changes in tidally filtered water levels, salinity and freshwater surpluses are shown. (NOAA)
W77-05133

OIL AND GAS USE CHARACTERIZATION, IMPACTS, AND GUIDELINES,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 6G.
W77-05134

MISSISSIPPI SOUND SALINITY DISTRIBUTION AND INDICATED FLOW PATTERNS,
Gulf Coast Research Lab., Ocean Springs, Miss. Physical Oceanography Section.
C. K. Eleuterius.
Mississippi-Alabama Sea Grant Consortium Report No. MASGP-76-023, (1976). 139 p, 74 fig, 88 tab, 13 ref, 4 photo, 2 append. NOAA SG-04-5-158-54.

Descriptors: Coasts, *Salinity, *Oceanographic data, *Circulation, Hydrography, *Estuaries, Sounds, Flow characteristics, Water circulation, Water pollution sources, *Path of pollutants, *Distribution patterns, Gulf of Mexico, Sounds.
Identifiers: *Mississippi Sound, Flow patterns.

This study of the circulation and salinity regime of Mississippi Sound describes the general patterns of flow indicated by the horizontal distribution of salinity at selected depth levels and the variability of salinity through the year. An appendix containing the tables of salinity statistics for each station has been included. Particular attention was given to certain areas or situations that it as felt warranted it in view of various activities planned or ongoing in the Sound industry those associated with disposal of domestic waste, dredging, fisheries, heavy industry and biological studies. The present practice of dredge spoil disposal in Mississippi Sound needs to be carefully scrutinized with particular attention to the alteration of flow patterns and the salinity regime. The change in either flow patterns or salinity regime affects the physical, chemical and biological environment. In order to properly manage the marine environment by assuring the continuation of the proper freshwater input, a freshwater budget for the Sound should be ascertained. (NOAA)
W77-05135

THE IMPACTS OF OUTER CONTINENTAL SHELF DEVELOPMENT ON LAFOURCHE PARISH,
New Orleans Univ., La. Urban Studues Inst.
For primary bibliographic entry see Field 6G.
W77-05136

A PROCESS FOR COASTAL RESOURCE MANAGEMENT AND IMPACT ASSESSMENT,
Coastal Environments, Inc., Baton Rouge, La.
For primary bibliographic entry see Field 6G.
W77-05137

HYDROCARBONS IN THE OCEAN,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5B.
W77-05139

CARIBBEAN-ATLANTIC WATER EXCHANGE THROUGH THE ANEGADA-JUNGFERN PASSAGE,
Woods Hole Oceanographic Institution, Mass.
W. G. Metcalf.
Journal of Geophysical Research, Vol. 81, No. 36, p 6401-6409, December 20, 1976. 7 fig, 2 tab, 30 ref. NSF DES71-00262, OCE75-19729.

Descriptors: *Water transfer, *Water circulation, *Atlantic Ocean, Temperature, Water temperature, Circulation, Currents(Water), Ocean current, Oceans, Graphical analysis, *Salinity, Oxygen, *Silicates, On-site investigations, Sampling, Oceanography, Measurement, *Dissolved oxygen.
Identifiers: *Caribbean Sea(Anegada-Jungfern Passage).

Measurements of the salinity, dissolved oxygen, and silicate from hydrographic stations occupied at opposite ends of the Anegada-Jungfern Passage were plotted graphically against potential temperature theta. The water column was divided into six layers on the basis of distinctive features in the theta -S, theta -02, and theta -silicate relationships. The differences and similarities among these features at opposite ends of the passage were correlated with geostrophic current computations to describe the current pattern through this passage. At about the 700-m level, the predominant current changes from a shallow flow into the Caribbean to a deeper outflow. In a layer 200 m thick immediately above sill depth (1815 m), the current alternates between inflow and outflow. The net transport through the passage is an inflow of roughly 1.4 Sv (1 Sv equal 1,000,000 cu m/s), mostly in the upper 400-500 m of the water column. The results were consistent with the distribution of water properties, and, in the case of the deepest layers, with direct current measurements made at the same time. (Sims-ISWS)
W77-05153

DESCRIPTION OF WIND, CURRENT, AND BOTTOM PRESSURE VARIATIONS ON THE CONTINENTAL SHELF IN THE NORTHEAST GULF OF ALASKA FROM FEBRUARY TO MAY 1975,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
S. P. Hayes, and J. D. Schumacher.
Journal of Geophysical Research, Vol. 81, No. 36, p 6411-6419, December 20, 1976. 9 fig, 1 tab, 23 ref.

Descriptors: *Continental shelf, *Currents(Water), *Winds, *Alaska, Continental slope, Salinity, Seasonal, Temperature, Frequency analysis, Water temperature, Ocean currents, Circulation, Ocean circulation, Time series analysis, On-site investigations, Coasts, Oceanography.
Identifiers: *Gulf of Alaska, Bottom pressure.

A moored array, with current and bottom pressure measurements on the continental shelf in the northeast Gulf of Alaska, was used to study the interrelationships among the low-frequency (less than 0.025 cph) variations of wind, current, and bottom pressure for the period February-May 1975. The circulation can be divided into a winter and a spring regime. This seasonal change was most clearly seen in the bottom pressure and its correlation with the alongshore wind and current. During February, the wind, bottom pressure, and currents were mutually coherent. A simple linear correlation between bottom pressure and alongshore current accounted for much of the variance. However, during March and April, the coherences were low, and the linear correlation was no longer valid. The data suggested that offshelf processes or nonlocal effects became more important. The monthly averaged data also indicated a seasonal change. The mean bottom pressure dropped by 12 cm from February to April. This was accompanied by only a 2-cm/s change in the mean alongshore flow. It was not possible to determine the influence of deepwater baroclinic changes on the seasonal bottom pressure change with the available hydrographic data. (Sims-ISWS)
W77-05154

CURRENT PROFILES IN THE CANARY CURRENT UPWELLING REGION NEAR CAPE BLANC, MARCH AND APRIL 1974,
Oregon State Univ., Corvallis. School of Oceanography.
D. R. Johnson.
Journal of Geophysical Research, Vol. 81, No. 36, p 6429-6439, December 20, 1976. 12 fig, 1 tab, 16 ref, 1 append. NSF GX-28746, GX-33502.

Descriptors: *Ocean current, *Upwelling, *Continental shelf, *Atlantic Ocean, *Africa, Current meters, On-site investigations, Continental slope, Currents(Water), Winds, Oceans, Coasts, Shores, Oceanography.
Identifiers: *Cape Blanc(Spanish Sahara), Current profiles.

In March and April 1974, profiles of horizontal currents were measured at several time series stations across the continental shelf and slope near Cape Blanc, Spanish Sahara. These profiles were compared with hydrographic sections made during the same period to produce circulation schemes at different states of upwelling. During the mature state (defined as favorble winds blowing steadily for several days), a dominant single-cell onshore-offshore flow occurs, which rotates in the upwelling sense and introduces upwelled water into the surface layers on the outer shelf. A secondary circulation system appears on the slope below the dominant cell, consisting of two oppositely rotating cells; the upper of these two cells rotates in the downwelling sense, and the lower rotates in the upwelling sense. An equatorward maximum of alongshore flow was observed over the outer shelf, and a poleward undercurrent was observed at depths between 200 m and 300 m along the slope. The possibility of topographic modifications as well as modifications by the Mauritanian current was also indicated. (Sims-ISWS)
W77-05156

LONG-PERIOD WAVES ON A NATURAL BEACH,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
D. A. Huntley.
Journal of Geophysical Research, Vol. 81, No. 36, p 6441-6449, December 20, 1976. 10 fig, 2 tab, 23 ref.

Descriptors: *Waves(Water), *Beaches, *Shore, On-site investigations, Measurement, Model studies, Mathematical models, Data processing, Energy, Energy transfer, Seashores, Ocean waves, Oceanography.
Identifiers: *Long-period waves, *England, Wave spectra.

A field experiment was described in which 3 two-component electromagnetic flowmeters were used to measure simultaneously the longshore (v) and onshore-offshore (u) velocity components along a line normal to the shoreline and up to 100 m offshore. Spectral analysis of the data from this experiment revealed the presence of a set of discrete spectral peaks of low frequency (0.014-0.05 Hz), which dominate over the wind wave peak close to the shoreline and which decay in amplitude with distance from the shore. The amplitudes of the velocity components for each of the four lowest-frequency (and clearest) peaks were plotted against distance from the shoreline and were found to compare satisfactorily with the calculated edge wave amplitude variation for the

beach. Phases between u, v at one flowmeter and between u, u at different distances offshore were also found from cross spectra and confirmd that the peaks are due to edge waves. It was suggested that each of these low-frequency peaks corresponds to a progressive edge wave mode at the cutoff frequency for the beach. The frequencies of the four lowest-frequency peaks agree well with the predicted frequencies for the lowest modes of cutoff edge waves, and the observed offshore decay of amplitude at each frequency indicates that assigning the peaks to these modes is correct. Energy exchange between these cutoff modes, through nonlinear interaction, was also suggested by the results. The significance of observing progressive edge waves on this beach was briefly discussed.(Sims-ISWS)
W77-05157

REMARKS ON THE SHORT TERM VARIABILITY OF THE PARAMETERS RELATING TO THE NUTRIENT AND OXYGEN BALANCE DURING THE SYNOPTIC INVESTIGATION OF SHALLOW INLETS DURING 1972, (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Marine and Fishery Biology.
For primary bibliographic entry see Field 5A.
W77-05159

NITROGEN CONTENT AND ACIDITY OF RAIN ON THE GEORGIA COAST,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5A.
W77-05163

ALGOLOGICAL OBSERVATIONS IN THE IDDEFJORD AND THE ADJACENT FJORD AREAS, S.E. NORWAY, (IN NORWEGIAN),
Oslo Univ. (Norway). Inst. of Marine Biology.
For primary bibliographic entry see Field 5C.
W77-05196

CONTROL OF SALT-WATER INTRUSION BY RECHARGE WELLS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
A. I. Kashef.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 102, No 1R4, p 445-457, December, 1976. 7 fig, 2 tab, 2 append. OWRT C-4061(9013)(5).

Descriptors: *Saline water intrusion, *Recharge wells, Coasts, *Control structures, Groundwater, Water pollution sources, Confined aquifers, Unconfined aquifers, *Groundwater recharge, Mathematical studies, *Saline water barriers.
Identifiers: *Recharge well batteries, *Salt water retardation, *Coastal aquifers, Theoretical formulation.

Various effects can be obtained by the arrangement of recharge well batteries in different patterns on the degree of salt-water retardation in coastal confined aquifers. The batteries are located at various distances parallel to the shoreline; each battery consists of equally spaced recharge wells of a certain number and all wells start operation at the same time. Theoretical formulas have been developed, available well formulas of water flow from recharge wells are considered without modifications. These formulas assume complete penetration of isotropic aquifers. A line source rather than actual well diameter is also assumed. In all investigated cases, a special datum is selected in such a way that a dimensionless total head would be equal to unity at the boundary between entirely freshwater and salt-water intruded zones. Equipotential intensities are determined for all cases at the nodes of a selected grid system. The resulting set of curves summarizes all cases and may be usefull in management problems. An example is solved which illustrates the use of the curves. (Heiss-NWWA)
W77-05207

A WATER QUALITY DATA REPORT OF THE COORDINATED MONITORING PROGRAM. METHODS AND DATA FOR 1974.
California State Resources Agency, Sacramento. Dept. of Water Resources.
Delta-Suisun Bay Ecological Studies, Methods and Data for 1974, April 1976. 333 p.

Descriptors: *California, *Estuaries, *Baseline studies, *Water quality, Water properties, *Resources development, Ecology, Data collections.
Identifiers: *Coastal zone management, San Francisco Bay, Delta-Suisan Bay.

The Delta-Suisun Bay Ecological Studies are conducted jointly by the United States Bureau of Reclamation (USBR) and the California State Department of Water Resources (DWR). This volume of the joint water quality data report of the USBR-DWR Coordinated Monitoring Program consists of two parts: The first is a methodology documentation of the collection, preservation, and analysis procedures used in obtaining data presented in this and previous reports. This section will be updated and published along with future reports containing water quality data. The second is a tabulation of data collected in the field. Future data will be published in similar reports. (Sinha-OEIS)
W77-05208

DEEP SEABED MINING (HEARINGS ON HR 1270, HR 6017, HR 11879 TO PROMOTE ORDERLY CONSERVATION AND DEVELOPMENT OF THE MINERAL RESOURCES OF THE DEEP SEABED).
For primary bibliographic entry see Field 6E.
W77-05209

NITROGEN AND PHOSPHORUS UTILIZATION BY SPARTINA ALTERNIFLORA IN A SALT MARSH IN BARATARIA BAY, LOUISIANA,
Louisiana State Univ., Baton Rouge. Lab. of Flooded Soils and Sediments.
For primary bibliographic entry see Field 5C.
W77-05228

THE DISTRIBUTION AND RELATION OF PARTICULATE ORGANIC MATERIAL AND PRIMARY PRODUCTIVITY IN THE GEORGIA BIGHT, 1973-1974,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5C.
W77-05232

SOME PROBLEMS IN THE SIMULATION OF VERY LARGE HYDRODYNAMIC SYSTEMS,
RAND Corp., Santa Monica, Calif.
A. B. Nelson.
In: Proceedings of the 1975 Winter Simulation Conference, Sacramento, California, Dec. 18-19, 1975 , p 695-701 (Published by Simulation Councils, Inc.). 7 fig.

Descriptors: *Simulation analysis, *Hydrodynamics, *Computer programs, *Computer models, Estuaries, Atmosphere, Oceanography, Systems analysis, *New York.
Identifiers: *Data management, Graphic display, *Jamaica Bay(NY).

Large-scale continuous simulation systems place greater demands on compuer resources than most computer applications. The need for extremely large amounts of high-speed core and CPU time can tax even the largest and fastest machines. In addition, the high cost of each simulation experiment places a great responsibility on the people involved in the design, implementation and use of such systems. This paper describes approaches to dealing with the difficulties inherent to the operation of several simulation programs, including both 2-D and 3-D estuary models (used for the study of tidal dynamics and water quality) and global models of ocean and atmospheric circulation. The computer requirements are discussed as well as some of the data management problems. Various procedures for simplifying the use of the programs and for validating and analyzing simulation resuls are considered, including graphic display. (Bell-Cornell)
W77-05258

HEAT BALANCE IN THE ESTUARINE REGION, (IN JAPANESE),
Hokkaido Univ., Hakodate (Japan). Faculty of Fisheries; and North Pacific Fisheries Inst., Sapporo (Japan).
T. Nakamura, and M. Kajihara.
Bull Fac Fish Hokkaido Univ 25(4), p 304-317, 1975.

Descriptors: *Estuaries, *Water temperature, Rivers, Asia, River discharge.
Identifiers: *Heat balance, *Japan(Yurappu River).

The temperature fluctuations in an estuary were studied from the viewpoint of the heat balance. Vertical temperature profiles in the sea, the temperature in the river water, the river discharge, solar radiation and other meteorological factors were measured on May 24, July 12, October 6-7 in 1973 and March 7-8 in 1974, in the sea off the mouth of the Yurappu River in Hokkaido (Japan). In the surface region close to the river mouth the temperature fluctuations in seawater and the relative changes of the heat capacity in the water column agreed with the temperature fluctuations in the river water. When the temperature fluctuations were treated in the defined space, the influence of the river discharge as a heat source was very small. In May and July temperature change from the mass transport was accompanied by landward and seaward winds. In Oct., though large amounts of cooler water were supplied by the river discharge, this moved outside of the defined space without the vertical mixing which might influence the water temperature. The temperature in the sea in the defined space cooled gradually because of the heat exchange at the sea surface.--Copyright 1976, Biological Abstracts, Inc.
W77-05291

CHARACTERISTICS OF THE PELAGIC ENVIRONMENT OF THE BRACKISH-WATER LAGOONS OF BAGES-SIGEAN AND SALSES-LEUCATE DURING THE SUMMER OF 1974, (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
For primary bibliographic entry see Field 5C.
W77-05304

NUMERICAL TIDAL MODEL OF CHESAPEAKE BAY,
National Oceanic and Atmospheric Administration, Princeton, N. J. Geophysical Fluid Dynamics Lab.
A. F. Blumberg.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY1, Proceedings Paper 12661, p 1-10, January 1977. 8 fig, 9 ref, 2 append. NOAA 04-3-022-33, 04-6-158-44076.

Descriptors: *Numerical analysis, *Chesapeake Bay, *Tidal waters, *Bays, *Mathematical models, Shallow water, Hydraulics, Rivers, Estuaries, Equations, Model studies.
Identifiers: *Tidal models, *Finite difference.

A two-dimensional plan view numerical model based upon the shallow water equations was developed to simulate the tidal dynamics of estua-

ries, rivers, and bays. The finite difference technique conserved mass, momentum (with no dissipation), and energy. The technique also allowed for easy employment of boundary conditions. The model was applied to the Chesapeake Bay with its varying bathymetry and many tributaries, showing the simulations predicting available observations. The presence of residual eddies was detected. Numerical simulations of the Bay demonstrated that the bottom friction value of Chezy's C equal to 63 was appropriate. (Bhowmik-ISWS)
W77-05356

AN X-Z HYDRAULIC/THERMAL MODEL FOR ESTUARIES,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W77-05358

SECOND APPROXIMATION TO GRAVITY WAVE ATTENUATION,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
For primary bibliographic entry see Field 8B.
W77-05366

FIELD DETECTION AND DAMAGE ASSESSMENT MANUAL FOR OIL AND HAZARDOUS MATERIAL SPILLS.
Environmental Protection Agency, Washington, D.C. Div. of Oil and Hazardous Materials.
For primary bibliographic entry see Field 5A.
W77-05374

EVALUATION OF MULTI-PURPOSE OFFSHORE INDUSTRIAL-PORT ISLANDS: GENERAL ISLAND CHARACTERISTICS.
Delaware Univ., Newark, Coll. of Marine Studies.
For primary bibliographic entry see Field 5G.
W77-05377

COMPUTER PREDICTION OF NEARSHORE AND SURF ZONE STATISTICS,
Tetra Tech, Inc., Pasadena, Calif.
C. J. Sonu.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A018 008, Price codes: A07 in paper copy, A01 in microfiche. Tetra Tech, Inc. Final Report prepared for Office of Naval Research, Geography programs, September 1975. 127 p, 32 fig, 10 tab, 32 ref, 2 append. N00014-69-C-0107.

Descriptors: *Computer programs, *Surf, *Shallow water, Coasts, Currents(Water), Waves(Water), Simulation analysis.
Identifiers: *Nearshore zone, Coastal zone, *Breakers, *Longshore currents, *Nomographs.

For the purpose of aiding in the strategic planning of naval inshore warfare operations, a study has been performed to develop prediction technology for shallow water waves, breakers, and longshore current velocities, using the visually observed deep water wave statistics as input. Computer programs, code-names 'BREAKM' and 'STATBR', and various nomographs have been developed to permit predictions for both physical magnitude and long-term statistics. Information display formats have been developed with a view to permitting speedy review of various key physical parameters and comparison between adjacent regions. Predicted results compare reasonably well with visually observed nearshore data, provided that a tolerable amount of discrepancy exists due partly to local conditions not accounted for in our prediction, partly to the built-in safety margin in our prediction, and partly to the limitations inherent to the state of the art. (Sinha-OEIS)
W77-05385

THE BENTHIC FAUNA AND SEDIMENTS OF THE NEARSHORE ZONE OFF PANAMA CITY BEACH, FLORIDA,
National Marine Fisheries Service, Panama City, Fla. Panama City Lab.
C. H. Saloman.
Army Coastal Engineering Research Center, Ft. Belvoir, Va., Report No. MR-76-10, August 1976. 256 p, 37 fig, 34 tab, 121 ref, 9 append.

Descriptors: *Hurricanes, *Florida, Meteorological data, *Beach erosion, *Environmental effects, *Resource development, *Baseline studies, Benthos, Sediments, Gulf of Mexico, Storms.
Identifiers: *Outer Continental Shelf, Nearshore, *Panama City(Fla).

Basic scientific data on the benthic fauna and surface sediments of the nearshore zone of Panama City Beach, Florida, before restoration of the beach, and the results of a study on the effect of Hurricane Eloise on the benthic fauna in the swash zone of Panama City Beach are presented. Surface sediments were analyzed for particle-size distribution, percent carbon, organic carbon and carbonate, and statistical factors. The surface sediments exhibited uniformity over time and location. The fauna was dominated by 14 species which constituted 80% of the collected individuals. The number of species and the diversity index were lowest in the swash zone and highest at the offshore stations at a depth of 30 feet. Mean grain size was the mot significant sediment factor tested. The effect of Hurricane Eloise on Panama City Beach was extensive. The beach and primary sand dune were severely eroded. (Sinha-OEIS)
W77-05386

EFFECTS OF DREDGING AND DISPOSAL ON SOME BENTHOS AT MONTEREY BAY, CALIFORNIA,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5C.
W77-05387

SAMPLING VARIATION IN SANDY BEACH LITTORAL AND NEARSHORE MEIOFAUNA AND MACROFAUNA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
J. L. Cox.
Army Coastal Engineering Research Center, Ft. Belvoir, Va., Technical Paper No. TP-76-14, September 1976. 72 p, 13 fig, 12 tab, 62 ref, 3 append. DACW72-75-C-0014.

Descriptors: *Baseline studies, *Beaches, *Resources development, *Sampling, Statistical methods, Sediments, Energy conversion, Aquatic life, Littoral, *California.
Identifiers: *Outer Continental Shelf, Coastal zone, Environmental factors, *Monterey Bay(Calif).

The sampling procedures and statistical methods for analysis of the fauna associated with high-energy sandy beaches was evaluated. One-season sampling of selected physical attributes and fauna of a relatively undisturbed beach site in central Monterey Bay, California was used as a basis for this evaluation. A procedure was devised for sampling surf-zone macrofauna using a suction dredge. Meiofauna shows distinct intertidal zonation patterns both in density and taxonomical composition. Considerable variation from one beach site to another can occur and this may be related to small changes in physical factors, especially the interstitial space. Procedures for subsampling and counting meiofauna are described along with recommendations from statistical treatment of data. (Sinha-OEIS)
W77-05388

GRAIN SHAPE AND SIZE DISTRIBUTION EFFECTS IN COASTAL MODELS,
Tetra Tech, Inc., Pasadena, Calif.
J. I. Collins, and C. B. Chesnutt.
Army Coastal Engineering Research Center, Ft. Belvoir, Va., Technical Paper No. TP-76-11, July 1976. 254 p, 31 fig, 8 tab, 25 ref, 3 append.

Descriptors: *Resources development, *Baseline studies, *Environmental effects, *Beach erosion, *Sediment transport, *Water pollution control, *Shore protection.
Identifiers: *Outer Continental Shelf, Grain shape, Grain size.

The effects of the model sediment-size distribution and particle shape in movable-bed models was investigated and Moda's scale relationship refined. An experimental evaluation of the scale model relationship was also performed. The results showed that the effects of grain shape and size distribution are varied. In many cases there was little or no measurable effect; in others, particularly for smaller wave steepnesses, marked differences were apparent. These included multiple bars on profiles consisting of sediment with a bimodal sediment-size distribution and an unstable bar on profiles consisting of sediment with a very narrow unimodal size distribution or s spherical grain shape. The experiments showed that the initial profile slope influences the final stable profile shape. (Sinha-OEIS)
W77-05389

THE VALUE AND VULNERABILITY OF COASTAL RESOURCES: BACKGROUND PAPERS FOR REVIEW AND DISCUSSION.
Georgia Dept. of Natural Resources, Atlanta, Resource Planning Section.
For primary bibliographic entry see Field 2L.
W77-05390

THE VALUE AND VULNERABILITY OF COASTAL RESOURCES: BACKGROUND PAPERS FOR REVIEW AND DISCUSSION.
Georgia Dept. of Natural Resources, Atlanta, Resource Planning Section.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 693, Price codes: A15 in paper copy, A01 in microfiche. Report to NOAA, Office of Coastal Zone Management, Washington, D. C., No. GADNR/OPR-75/1, May 1975. 329 p.

Descriptors: *Georgia, *Baseline studies, *Coasts, Resources, *Natural resources, *Resources development, Water resources, *Environmental effects, Value, Management.
Identifiers: *Coastal zone management, *Environmental conditions, Vulnerabilities.

A series of background papers written by individual scientists and researchers in the University system of Georgia and in the Department of Natural Resources, for the Georgia Coastal Zone Management Program, present in summary form, available information on the benefits resulting from the natural functioning of the coastal resources, and the susceptibility of these resources to change. This is important background information that should be used in developing coastal zone management policies and programs. (See W77-05391 thru W77-05401) (Sinha-OEIS)
W77-05390

A RESOURCE PLANNING PROCESS FOR GEORGIA'S COAST,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 6G.
W77-05391

THE VALUE AND VULNERABILITY OF COASTAL BEACHES, SAND DUNES, AND OFFSHORE SAND BARS,
Skidaway Inst. of Oceanography, Savannah, Ga.
G. F. Oertel.

In: The Value and Vulnerability of Coastal Resources, Georgia Department of Natural Resources Report No. GADNR/OPR-75-1, p 9-33, May 1975. 3 fig, 25 ref.

Descriptors: *Georgia, *Baseline studies, *Coasts, Resources, *Natural resources, *Resources development, Water resources, *Environmental effects, *Beachs, Dunes, Sand-bars, Dredging, Channel improvement.
Identifiers: *Coastal zone management, *Environmental conditions, Vulnerabilities.

From a sedimentologic point of view, the dune-beach-bar systems of Georgia are valuable for a least three major reasons. First, the system is a barrier that protects land behind it. Second, the system maintains a sediment budget that determines the stability of the shoreline. Third, the system dissipate the energy of major storm waves before the total energy of these waves can be directed at the property above the beach. There are a number of features that are critical to the functioning of the dune-beach-bay system. Dune plants are one of the more obvious features. If these plants are destroyed, the accumulation of sand in coastal dunes in inhibited and the recovery of dunes between storms is slowed down considerably. The shapes of the recovery of dunes between storms is slowed down considerably. The shapes of offshore bars and shoals are also important since they often determine the paths of tidal flow and ultimately of sediment transport. The dune-beach-bar system is self-adjusting to small changes in physiography, sediment inplut and energy distribution. The type of stresses which affect the functioning of the dune-beach-bar system are the periodic increases in physical energy due to storms. Seawalls, groins, dredging and channeling are all stresses which impeded the transport of sediment by natural processes. Each of these stresses has a different impact on the system and the system adjusts in a different manner to each type of stress. (See also W77-05390) (Sinha-OEIS)
W77-05392

TERRESTRIAL ECOLOGY OF THE GEORGIA BARRIER ISLANDS,
Georgia Univ., Athens. Dept. of Zoology.
J. I. Richardson, and J. S. Worthington.
In: The Value and Vulnerability of Coastal Resources, Georgia Department of Natural Resources Report No. GADRN/OPR-75/1, p 35-111, May 1975. 4 fig, 2 tab, 47 ref.

Descriptors: *Georgia, *Baseline studies, *Coasts, *Barrier islands, *Ecology, Resources, Water resources, *Biological communities, *Environmental effects, Geology, Hydrology, Value, Fauna, Salinity.
Identifiers: *Coastal zone management, *Environmental conditions, Vulnerabilities.

The terrestrial ecology of Georgia barrier islands, the physical environment which shapes the island community, and the strategies of survival employed by its members is summarized. Also discussed are values of component parts to the natural island system and the vaulnerability of the system to changes by man. The description of terrestrial island ecology as a means of increasing man's awareness of his environment is a self-evident value. This overview of the functional aspects of island ecology improves understanding of the ecology of Georgia barrier islands and suggestions are made: an inventory of natural resources; determination of minimal portion of ecosystem needed to describe an environmental attribute; development of basic ecological functions on Georgia coastal islands; updating ecological surveys; development of predictive models; and establishment of management guidelines. (See also W77-05390) (Sinha-OEIS)
W77-05393

THE VALUE AND VULNERABILITY OF FRESH WATER ECOSYSTEMS,
Georgia Inst. of Tech., Atlanta. Dept. of Zoology.
For primary bibliographic entry see Field 6G.
W77-05394

A SUMMARY OF GROUND WATER CONDITIONS COASTAL GEORGIA,
Georgia Dept. of Natural Resources, Atlanta. Earth and Water Div.
D. E. Swanson.
In: The Value and Vulnerability of Coastal Resources, Georgia Department of Natural Resources Report No. GADNR/OPR-75/1, p 137-170, May 1975. 15 fig, 1 tab, 32 ref.

Descriptors: *Georgia, *Coasts, *Ground water, *Resources development, Water resources, *Baseline studies, *Natural resources, *Environmental effects, Aquifers, Artisian aquifers, Recharge.
Identifiers: *Coastal zone management, *Environmental conditions, Industrial usage.

The water of this region is bountiful; it is also very complex. This is particularly true of ground water. In recent years, numerous studies have been devoted to problems which have developed as a result of the large ground water withdrawals by various industries along the coast. Probably the greatest stress to the ground water supply which nature causes is the minor variations in annual precipitation, Man has strained the aquifer system in the coastal area to a much larger degree than nature has. Past studies of ground water in the coastal area have resulted in a fine data base which has allowed parts of the system to be modeled by modeled by digital computer. (See also W77-05390) (Sinha-OEIS)
W77-05395

AN OVERVIEW OF COASTAL GEORGIA WILDLIFE,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
J. L. McCollum.
In: The Value and Vulnerability of Coastal Resources, Georgia Department of Natural Resources Report No. GADNR/OPR-75/1, p 171-182, May 1975. 10 ref.

Descriptors: Georgia, *Wildlife, *Barrier islands, *Baseline studies, *Resources development, *Environmental effects, Coasts, Natural resources, Water resources.
Identifiers: *Coastal zone management, *Environmental conditions.

An overview of coastal wildlife drawing upon available printed sources of information is given. The information gives a general background upon which a further synthesis of wildlife information for coastal Georgia can be based. Further research is needed on wildlife species and wildlife habitats, especially habitats locatd in dry, upland areas where pressures for urbanization may occur. Future research needs include delineation of habitats for endangered species, and research related to the inter-relationships of habitats and species with each other. The effects of man's activities on important wildlife habitats should be assessed and intergrated into local and State planning programs. (See also W77-05390) (Sinha-OEIS)
W77-05396

COASTAL GEORGIA'S CULTURAL RESOURCES,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 6G.
W77-05397

SOILS INFORMATION FOR COASTAL GEORGIA,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
R. D. Lyberger.
In: The Value and Vulnerability of Coastal Resources, Georgia Department of Natural Resources Report No. GADNR/OPR-75/1, p 201-211, May 1975. 2 ref.

Descriptors: *Georgia, *Soils, *Natural resources, *Baseline studies, Coasts, *Resources development, Soil management, Mapping, Land use.
Identifiers: *Coastal zone management, Environmental conditions.

The soils of the coastal region of Georgia have been or are in the prcess of being mapped at two different levels of detail; the general soil map and the detailed soil map. The nature of the information is similar on both scales of maps. The two levels of mapping and description must be applied in different ways in land use planning. The soil asociation maps are useful for obtaining a general idea of the soils in a region, comparing different parts of a region, or locating large tracts that are suitable for a certain kind of land use. the use of the detailed soil survey is necessary for planning the management of farms or fields, or for selecting the exact location of a road or building. Further investigation in the form of field work is necessary for such things as checking the specific site for a septic tank location or for completing the final design and isntallation of engineering structures. (See also W77-05390) (Sinha-OEIS)
W77-05398

VEGETATION INFORMATION FOR COASTAL GEORGIA,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
R. D. Lyberger.
In: The Value and Vulnerability of Coastal Resources, Georgia Department of Natural Resources Report No. GADNR/OPR-75/1, p 213-222, May 1975. 2 tab, 8 ref.

Descriptors: *Georgia, *Vegetation, *Baseline studies, *Resources development, *Soils, Resources, *Natural resources, Water resources, Maps, Coasts, Environmental effects.
Identifiers: *Coastal zone management, Environmental conditions.

The vegetation of the coastal region of Georgia has been classified and mapped as a part of the statewide Georgia Resource Assessment Program. The method by which the categories were defined and mapped (largely based on difference in physiograhic location and physiognomic characteristics observable on 1'=1 mile aerial photo mosaics) means that the mapping units are more appropriately designated as vegetative cover types than as true community types. Plant species generally do not occur singularly, but in association with many other species of plants and animals. A wide variety of factors interact to produce patterns of individuals and associations of species. As a result, vegetation is a delicate integradtion of environmental conditions. (See also W77-05390) (Sinha-OEIS)
W77-05399

THE MARSHES,
National Park Service, Atlanta, Ga.
A. S. Johnson, H. O. Hillestad, S. A. Fanning, and G. Shanholtzer.
In: The Value and Vulnerability of Coastal Resources, Georgia Department of Natural Resources Report No. GADNR/OPR-75/1, p 223-256, May 1975. Excerpted from An Ecological Survey of the Coastal Region of Georgia, A Report to the National Park Service, Aug 1971. 2 fig, 4 tab.

Descriptors: *Georgia, *Marshes, *Grasses, *Baseline studies, *Resources development, *Environmental effects, Water resources, Coasts, Resources, Natural resources.
Identifiers: *Coastal zone management, Environmental conditions.

A 4-to 6-mile band of marshland comprising about 393,000 acres lies behind the barrier islands. Nearly 286,000 acres of this is covered by a single species of marsh grass, known as saltmarsh or smooth cordgrass. The remaining 106,000 acres consists of several other types of salt, brackish and freshwater marshes. Information on the vegetation, the biological communities of flora and fauna, the energy flow and the food web is delineated. (See also W77-05390) (Sinha-OEIS)
W77-05400

THE OPEN MARINE AND ESTUARINE WATERS,
National Park Service, Atlanta, Ga.
A. S. Johnson, H. O. Hillestad, S. A. Fanning, and G. F. Shanholtzer.
In: The Value and Vulnerability of Coastal Resources, Georgia Department of Natural Resources Report No. GADNR/OPR-75/1, p 257-32, May 1975. Excerpted from An Ecological Survey of the Coastal Region of Georgia, A Report to the National Park Service, Aug 1971. 2 fig, 6 tab, 299 ref.

Descriptors: *Georgia, *Baseline studies, *Estuaries, Water resources, *Resources development, Marshes, Natural resources, Coasts, Fisheries, Resources, Natural resources, Environmental effects, *Bibliographies.
Identifiers: *Coastal zone management, Environmental conditions, Ecological surveys.

The estuaries of Georgia connect with the sea through the sounds that separate the barrier islands. These are north to south from the Savannah River Entrance to the St. Marys River Entrance: Wassaw Sound, Ossabaw Sound, St. Catherines Sound, Sapelo Sound, Doboy Sound, Altamaha Sound, St. Simons Sound, and St. Andrews Sound. Salt water is diluted by fresh water from the Savannah, Ogeechee, Altamaha, Satilla, and St. Marys rivers. The coastal or inshore waters extend from the mounts of the sounds and from the barrier beaches to a depth of about 60 feet. The offshore waters of the continental shelf lie beyond. The continental shelf along the Georgia coast is 70 to 80 miles wide with a gentle slope of about two feet per mile. Information on the physical characteristics, sediments, fauna, fishery resources, productivity and energy flow, and food webs is outlined. (See also W77-05390) (Sinha-OEIS)
W77-05401

COASTAL DEVELOPMENT AND AREAS OF ENVIRONMENTAL CONCERN,
North Carolina State Univ., Raleigh. Sea Grant Advisory Services.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 358, Price codes: A05 in paper copy, A01 in microfiche. Proceedings of a Symposium held at East Carolina University, Greenville, NC on March 5, 1975. North Carolina University Sea Grant Report No. UNC-SG-75-18, September 1975. 96 p. Simon Baker, editor. SG-04-3-158-40.

Descriptors: *Coasts, *North Carolina, Water resources, *Resources development, Conservation, Estuaries, Ecology, Archaeology, History, Public rights, Jurisdiction, Planning, Management.
Identifiers: *Resources management, *Environmental concern, *Coastal zone management, *Public interest.

The proceedings of the symposium on Coastal Development and Areas of Environmental Concern are reported. The meeting was carried out as an educational effort to acquaint elected officials, planners, and the public with the reasons why certain locations require special consideration as Areas of Environmental Concern (AEC). The Coastal Area Management Act (CAMA) passed by the North Carolina Legislature in April 1974 contains a list of type areas to be considered by the Coastal Resources Commission (CRC) for designation as Areas of Environmental Concern. Discussion of these areas formed the basis for the meeting. Some of the topics covered and contained in this report are: Designation of areas of critical state concern in Oregon; Extent and distribution of areas of environmental concern in North Carolina; Coast and dunes; Utilization of soils information in coastal area management; Dredging and birds in the North Carolina estuary; Salt marshes; The estuary--an area of environmental concern; Archaeological sites as interim areas of environmental concern; and Implementation of the coastal area management act. (See also W77-05403 thru W77-05413) (Sinha-OEIS)
W77-05402

DESIGNATION OF AREAS OF CRITICAL STATE CONCERN IN OREGON,
Oregon Coastal Conservation and Development Commission, Salem.
For primary bibliographic entry see Field 6G.
W77-05403

EXTENT AND DISTRIBUTION OF AREAS OF ENVIRONMENTAL CONCERN IN NORTH CAROLINA,
North Carolina Dept. of Natural and Economic Resources, Raleigh.
For primary bibliographic entry see Field 6G.
W77-05404

COASTAL SAND DUNES,
North Carolina State Univ., Raleigh. Dept. of Botany; and North Carolina State Univ., Raleigh. Dept. of Soil Science.
E. D. Seneca.
In: Coastal Development and Areas of Environmental Concern, Proceedings of Symposium held Greenville, NC on March 5, 1975. North Carolina University Sea Grant Report No. UNC-SG-75-18, p 23-27, September 1975. 1 fig.

Descriptors: *North Carolina, *Shore protection, *Sand bars, *Dunes, Barrier islands, Public rights, Baseline studies, Vegetation.
Identifiers: *Public interest, *Resources management, *Environmental concern, Coastal zone management, *Sand dunes.

Vegetated coastal dunes are an integral part of the barrier islands and can serve to protect estuaries, roads, and structures from the effects of the open ocean on a temporary basis. Dunes are flexible and fragile structures that require protection and repail to continue their normal function as a part of the nearshore-beach-foredune system. (See also W77-05402) (Sinha-OEIS)
W77-05405

SCENERY FOR SALE,
North Carolina Univ. at Chapel Hill. Marine Sciences Curriculum.
For primary bibliographic entry see Field 6G.
W77-05406

UTILIZATION OF SOILS INFORMATION IN COASTAL AREA MANAGEMENT,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
S. W. Broome.
In: Coastal Development and Areas of Environmental Concern, Proceedings of Symposium held Greenville, NC on March 5, 1975. North Carolina University Sea Grant Report No. UNC-SG-75-18, p 42-47, September 1975. 1 fig, 4 ref.

Descriptors: *North Carolina, *Estuaries, *Soil management, Coasts, Soils, Management, Public rights, Conservation, Maps.
Identifiers: *Resource management, *Environmental concern, *Coastal zone management, Public interest.

Soil maps and soil scientists with knowledge of soil mapping and interpretations can be of assistance to coastal planners. The soil resource must be considered in any land-use plan since it determines agricultural and biological production, and its engineering properties determine the potential for urban and industrial development at a particular location. Soil maps are useful in establishing criteria for developing coastal zoning categories which delineate ecologically sensitive areas (e.g. areas of environmental concern) and those areas suitable for development in a manner compatible with natural systems. Soil mapping in the North Carolina coastal management area is rather incomplete, but there is information available that would be helpful if adequately compiled, organized and interpreted. (See also W77-05402) (Sinha-OEIS)
W77-05407

DREDGING AND BIRDS IN THE NORTH CAROLINA ESTUARY,
North Carolina Univ. at Wilmington. Dept. of Biology.
For primary bibliographic entry see Field 6G.
W77-05408

SALT MARSHES,
North Carolina Univ. at Chapel Hill. Marine Sciences Program.
D. Frankenberg.
In: Coastal Development and Areas of Environmental Concern, Proceedings of Symposium held Greenville, NC on March 5, 1975. North Carolina University Sea Grant Report No. UNC-SG-75-18, p 54-58, September 1975. 2 tab, 2 ref.

Descriptors: *North Carolina, *Salt marshes, *Resources development, *Estuaries, Coasts, Ecology, Public rights.
Identifiers: *Resources management, *Environmental concern, *Coastal zone management, Public interest.

The objectives are to describe: the geographic extent of salt marshes in North Carolina; the reasons why these areas are of environmental concern; and the issues that should underlie decisions to develop salt marshes. There are two major reasons why salt marshes have been designated as interim areas of environmental concern: salt marhes are utilized as nursery areas by many animals that are harvested in important commercial and sport fisheries; and salt marshes are productive natural areas upon which many animals depend for food. The fisheries and ecological systems that define the coastal region depend upon the physical structure and productivity of the salt marshes. It must also be clear that we need not preserve every blade of grass on every marsh. The benefits of marshes depend upon the aggregate acreage. Insofar as we can understand the complexities of salt marsh ecology and the social benefits derived from its unimpeded functioning, we can wisely plan development to foster the greatest good for the greatest number. (See also W77-05402) (Sinha-OEIS)
W77-05409

THE ESTUARY - AN AREA OF ENVIRONMENTAL CONCERN,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Coastal Fisheries Research Center.
G. W. Thayer.
In: 'Coastal Development and Areas of Environmental Concern', Proceedings of Symposium held Greenville, NC on March 5, 1975. North Carolina University Sea Grant Report No. UNC-SG-75-18, p 59-72, September 1975. 2 fig, 4 tab, 10 ref.

Descriptors: *North Carolina, *Estuaries, *Resources development, Water resources, Coasts, Ecology, Public rights, Environment.
Identifiers: *Resources management, *Environmental concern, *Coastal zone management, Public interest.

Estuaries have developed and evolved over geological time, and the plant and animal communities dependent upon these systems have evolved to high levels of productivity and diversity in response to the relatively large changes in the natural environment. Man has placed a multiplicity of demands upon estuarine and coastal environment as producers of food, as avenues of transportation, as receptacles of wastes, as living space, and as sources of recreational or esthetic pleasure. Man uses the biological productivity of estuaries for human and animal food, clothing, fertilizers, chemicals, and for a variety of industrial and construction materials. The high biological productivity leads to a large concentration of organisms, including people; transportation centers; good fishing; the presence of the sea provides a large water resource for removal of wastes; a favorable climate; and for just plain esthetic reasons. The complete and total preservation of our estuaries is obviously not possible but the management of our estuarine areas for the greatest national benefit means that decisions must be made and compromises reached between users of these areas when their aims are not compatible. (See also W77-05402) (Sinha-OEIS)
W77-05410

ARCHAEOLOGICAL SITES AS INTERIM AREAS OF ENVIRONMENTAL CONCERN,
East Carolina Univ., Greenville. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6G.
W77-05411

HISTORIC SITES,
North Carolina Dept. of Cultural Resources, Raleigh.
For primary bibliographic entry see Field 6G.
W77-05412

IMPLEMENTATION OF THE COASTAL AREA MANAGEMENT ACT,
North Carolina Univ. at Chapel Hill. Urban Services Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6E.
W77-05413

STATUS OF OCEAN DUMPING RESEARCH IN NEW YORK BIGHT,
MESA New York Bight Project Office, Stony Brook.
For primary bibliographic entry see Field 5B.
W77-05443

WAVE ENERGY TRANSFORMATION OVER IRREGULAR BOTTOM,
Delaware Univ., Newark. Dept. of Civil Engineering.
J. C. Shiau, and H. Wang.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW1, Proceedings Paper 12740, p 57-68, February 1977. 9 fig, 13 ref, 2 append. ONR N00014-75-C-0876.

Descriptors: *Coastal engineering, *Energy transfer, *Shallow water, Ocean waves, Energy dissipation, Oceans, Hydraulics, Equations, Mathematical studies, Waves(Water).
Identifiers: *Ocean bottom, Spectral analysis, *Transformation(Wave energy), Shallow water waves, *Wave energy.

A numerical model was developed to determine shallow water wave spectra at designated spatial locations in an area where the bottom topography is irregular. The required input is either deep water wave spectra or measured wave spectra at the seaward boundary. The model was a linear one and was based on the assumption that the wave energy associated with a narrow frequency band stayed with the band upon refraction. Energy dissipation has been neglected. The model was verified with analytical solutions for the case of two-dimensional parallel bottom contours, and it compared well with field measurements at locations beyond the surf zone. (Lee-ISWS)
W77-05444

WAVE ENTRAINMENT OF SEDIMENT FROM RIPPLED BEDS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2J.
W77-05445

INSTRUMENTS FOR STUDYING OCEAN POLLUTION,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W77-05448

SEA SURFACE TEMPERATURE RELATED TO RAIN IN CEARA, NORTHEASTERN BRAZIL,
California State Univ., Fresno, Dept. of Geography.
For primary bibliographic entry see Field 2B.
W77-05449

GAS-BUBBLE MORTALITY OF FISHES IN GALVESTON BAY, TEXAS,
Bureau of Commercial Fisheries, Galveston, Tex. Biological Lab.
For primary bibliographic entry see Field 5C.
W77-05462

THE USE OF REMOTE SENSING IN A STUDY OF SUBMERGED AQUATIC MACROPHYTES OF THE PAMLICO RIVER ESTUARY, N.C.,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W77-05487

FIELD STUDIES ON THE SURVIVAL OF COLIFORMS AND E. COLI IN SEAWATER,
South Australia Engineering and Water Supply Dept., Salisbury. Water and Water Pollution Control Lab.
For primary bibliographic entry see Field 5B.
W77-05530

FINAL ENVIRONMENTAL STATEMENT. VOL 1, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
For primary bibliographic entry see Field 6G.
W77-05536

FINAL ENVIRONMENTAL STATEMENT. VOL 2, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
For primary bibliographic entry see Field 6G.
W77-05537

FINAL ENVIRONMENTAL STATEMENT. VOL 3, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
For primary bibliographic entry see Field 6G.
W77-05538

FINAL ENVIRONMENTAL STATEMENT. VOL 4, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
For primary bibliographic entry see Field 6G.
W77-05539

FINAL ENVIRONMENTAL STATEMENT. VOL 5, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
For primary bibliographic entry see Field 6G.
W77-05540

POTENTIAL INFLUENCE OF THERMAL EFFLUENTS ON THE PRODUCTION AND WATER-USE EFFICIENCY OF MANGROVE SPECIES IN SOUTH FLORIDA,
San Diego State Univ., Calif. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-05546

ROOTING AND GROWTH OF RED MANGROVE SEEDLINGS FROM THERMALLY STRESSED TREES,
Puerto Rico Nuclear Center, Mayaguez.
For primary bibliographic entry see Field 5C.
W77-05547

THE EFFECTS OF THERMAL LOADING ON THE GROWTH AND ECOLOGY OF A NORTHERN POPULATION OF SPARTINA ALTERNIFLORA,
Maine Univ., Orono. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5C.
W77-05548

EFFECTS OF POWER-PLANT ENTRAINMENT TEMPERATURES ON OXYGEN CONSUMPTION PATTERNS OF AMPHIPODS AND GRASS SHRIMP,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
For primary bibliographic entry see Field 5C.
W77-05553

INFLUENCE OF THERMAL LOADING ON THE ECOLOGY OF INTERTIDAL ALGAE,
Maine Univ. at Orono. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5C.
W77-05574

SEASONAL DISTRIBUTION OF A PODOCOPID OSTRACOD IN A THERMALLY ALTERED AREA OF TAMPA BAY, FLORIDA,
University of South Florida, St. Petersburg. Dept. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-05577

CHRONIC IN SITU EXPOSURE OF THE BAY SCALLOP TO POWER-PLANT EFFLUENTS,
University of South Florida, St. Petersburg. Dept. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-05578

SEASONAL ABUNDANCE, BIOMASS, DIVERSITY, AND TROPHIC STRUCTURE OF FISH IN A SALT-MARSH TIDAL CREEK AFFECTED BY A COASTAL POWER PLANT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W77-05581

THERMAL EFFLUENT IN COASTAL RIVERS: A CONTRIBUTION TO THE LOCATION OF POWER PLANTS,
University of South Florida, St. Petersburg. Dept. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-05587

INTERACTIVE EFFECTS OF TEMPERATURE, SALINITY, AND OTHER FACTORS ON COASTAL COPEPODS,
Florida Univ. at Marineland, St. Augustine. C. V. Whitney Marine Lab.
For primary bibliographic entry see Field 5C.
W77-05591

ENTRAINMENT OF ESTUARINE ZOOPLANKTON INTO A MID-ATLANTIC POWER PLANT: DELAYED EFFECTS,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 5C.
W77-05592

ASSESSMENT OF POWER-PLANT EFFECTS ON ZOOPLANKTON IN THE NEAR FIELD,
Martin Marietta Corp., Baltimore, Md. Environmental Technology Center.
For primary bibliographic entry see Field 5C.
W77-05593

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3B. Water Yield Improvement

MULTIPLE USE IN SOUTHERN APPALACHIAN HARDWOODS--A 10-YEAR CASE HISTORY,
Southeastern Forest Experiment Station, Franklin, N.C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 4A.
W77-05112

USING REPRESENTATIVE WATERSHEDS TO MANAGE FOREST AND RANGE LANDS FOR IMPROVED WATER YIELD,
Forest Service (USDA), Washington, D. C. Div. of Watershed Management.
For primary bibliographic entry see Field 4D.
W77-05120

SUPPRESSION OF EVAPORATION LOSSES FROM SNOWPACKS,
Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
J. L. Smith, and H. G. Halverson.
In: American Society of Civil Engineers, Proceedings of the Symposium on Interdisciplinary Aspects of Watershed Management, Bozeman, Montana, Aug. 3, 1970, p 5-25, 1971. 17 ref.

Descriptors: *Snowpacks, Snowmelt, *Evaporation control, *California, Mountain forests, Antitranspirants.
Identifiers: Sierra Nevada range(Calif).

Depending on location and weather, evaporation losses from snowpacks on the Sierra Nevada of California range from negligible to sizable amounts. These losses can be estimated by using formulas. Evaporation can be suppressed by applying monolayers of long-chain-fatty alcohol on the snow surface. To achieve maximum reduction, 12 pounds per acre is suggested. This amount does not cause significant snowmelt. Nor does it migrate from point of a location if it is aged enough before application. One application is enough to last throughout the winter season. (Forest Service)
W77-05123

A COMPUTER-AIDED SNOWMELT MODEL FOR AUGMENTING WINTER STREAMFLOW SIMULATION IN A SOUTHERN ONTARIO DRAINAGE BASIN,
Ontario Ministry of the Environment, Toronto (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W77-05247

WORKSHOP FOR AN ASSESSMENT OF THE PRESENT AND POTENTIAL ROLE OF WEATHER MODIFICATION IN AGRICULTURAL PRODUCTION,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
L. O. Grant, and J. D. Reid.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 633, Price codes: A11 in paper copy, A01 in microfiche. Compilation of Workshop Materials for Workshop held at Colorado State University, July 15-18, 1975. 236 p, 22 fig, 13 tab, 53 ref.

Descriptors: *Weather, *Weather modification, *Agriculture, *Weather patterns, Rainfall, Crop production.

The broad objective is to make an authoritative evaluation of the present and potential role that weather modification can take in increasing national and world agricultural production. A specific objective includes the preparation of an authoritative document that can receive wide distribution and provide for extensive utilization of the results of the assessment. This document will: (1) identify the geographical areas and types of weather modification research that can have the greatest impact on agricultural production and other renewable resources; (2) provide background and guidance to NSF and other federal and state research managers. This can apply to those with responsibilities in the discipline areas of weather modification, meteorology, agriculture and atmospheric science; (3) provide information to state and federal public administrators (Office of Technical Assessment, OMB, etc.), legislators, courts and the general public that can assist them in making wise decisions and plans regarding applications of weather modification; (4) delineate the needs, required efforts, and methods for a longer term, continuing evaluation of the interrelations between weather modification and agriculture. (Skogerboe-Colo St)
W77-05310

3C. Use Of Water Of Impaired Quality

EFFECT OF A SEAWATER PREPARATION ON GERMINATION RATE, SEED VIGOR AND FORMATION OF THE MASS OF PLANT SEEDLINGS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii i Agrokhimii.
P. A. Vlasyuk, V. P. Barannik, M. S. Galinskaya, and M. N. Lyubchenko.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina. 9, p 11-12, 1974.

Descriptors: Sea water, *Seeds, Magnesium, Zinc, Calcium, Sodium, Chromium, Copper, Iron, Boron, Potassium, Nickel, Manganese, *Germination, Organic matter, *Fertilization, Wheat, Barley, Sugar beets.
Identifiers: Buckwheat, Millet, *Sea water preparation.

Presowing treatment of seeds with a sea water preparation (SP) containing Mg, Zn, Co, Ca, Na, Cr, Cu, K, B, Ni, Mn and Fe oxides (of which 93% were sorbed) and about 1.5% organic matter (primarily products of protein breakdown) and its application to the soil in the presence of NPK fertilizers had a favorable effect on seed germination rate and vigor. It increased the mass of 20-day-old sprouts of wheat, barley, sugar beet, backwheat and millet.--Copyright 1975, Biological Abstracts, Inc.
W77-05171

STUDIES ON SOIL SALINIZATION AND ALKALIZATION AS AFFECTED BY IRRIGATION WATERS, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
M. Colibas, A. Maianu, and I. Colibas.
An Inst Stud Cercet Pedol. 40, p 427-441, 1972.

Descriptors: *Salinity, *Saline soils, *Alkaline soils, *Irrigation water, *Mineralogy, Corn(Field), Crop production.

The effects of irrigation with waters of different mineralization levels (up to 1.7 g/l) and salt composition on the Simand meadow chernozem, planted with corn, were studied. Irrigation was applied daily, without soil washing, this latter being maintained for the whole vegetation period at 50% of soil waterholding capacity. Irrigation with such waters resulted in changes in soil reaction (particularly in the variants with NaCl, Na2SO4 and NaHCO3), and salinization (increasing together with irrigation rates and water mineralization) and alkalization levels (increasing particularly in the variants receiving waters with NaHCO3, either alone or combined with NaCl and Na2SO4). Corn kernel and green matter yields were negatively affected by waters containing especially NaHCO3, NaCl or MgCl2.--Copyright 1975, Biological Abstracts, Inc.
W77-05190

CHANGE OF ORGANIC SUBSTANCES IN VIRGIN AND ARABLE CINNAMONIC CALCAREOUS MOUNTAIN SOILS DEPENDING ON THE DEGREE OF THEIR EROSION, (IN RUSSIAN),
For primary bibliographic entry see Field 2J.
W77-05220

USE OF GEOTHERMAL WATER FOR AGRICULTURE,
Utah State Univ., Logan.
A. A. Bishop.
Available from the National Technical Information Service, Springfield, VA 22161 as ANCR-1221, UC-13, Price codes: A03 in paper copy, A02 in microfiche. Aerojet Nuclear Company, Idaho National Engineering Laboratory, Idaho Falls, Idaho. No. 1221, June 1975. 26 p, 10 fig, 1 tab, 30 ref.

Descriptors: *Geothermal studies, *Agriculture, Irrigation, Water quality, Crop production.
Identifiers: *Geothermal water.

The use of geothermal resources in agriculture will depend largely upon the site specific conditions of the resources. Both water and heat have many applications in agricultural production and the technologies for their use are generally known. When the quantity, quality, and the location of the

geothermal water supply are known, the value of the water for irrigation can be readily estimated. The value for other uses such as for food and feed processing, space heating and cooling for crops and for animals is less readily determined. Application of geothermal water for irrigation purposes as well as other farm uses is extensively discussed. Advantages and disadvantages of the use of geothermal water for animal production are presented. (Skogerboe-Colo St)
W77-05309

THE DASHTE-NAZ GROUND-WATER BARRIER AND RECHARGE PROJECT,
Agro-Water Consulting Engineers, Tehran (Iran).
For primary bibliographic entry see Field 4B.
W77-05365

3D. Conservation In Domestic and Municipal Use

RURAL RESIDENTIAL WATER DEMAND: AN ECONOMETRIC AND SIMULATION ANALYSIS,
Kentucky Univ., Lexington. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6D.
W77-05187

REORIENTATION OF URBAN-RELATED WATER RESOURCES RESEARCH,
Rutgers - The State Univ., New Brunswick, N.J.
W. Whipple, Jr., and M. M. Hufschmidt.
Water Resources Research, Vol. 12, No. 4, p 762-766, August 1976. 4 ref. OWRT B-062-NJ(2).

Descriptors: *Water resources, *Research, Water quality, Flood plains, Management, Recreation, Land use, Planning, Flood plain insurance.
Identifiers: Water-land interfaces.

A workshop was held at Quail Roost, North Carolina in July 1975 to develop recommendations for a research program for urban-related water problems. The article summarizes the workshop recommendations for reorienting current research strategy and priorities. Workshop participants concluded that the federal research program on urban-related water problems is inadequate to meet future needs and is urgently in need of redirection, particularly concerning water quality, flood plain management, land-water interfaces, and governmental institutional arrangements. Reported in the area of water quality are technologies of data gathering, measurment, and analysis, the environmental effects of pollution, and the organization for water quality decision making. Considered in the area of water-land interfaces are urban water-oriented recreation, aesthetic aspects of urban design, and implementing water-related land use plans. Discussed also are flood plain management goals and objectives and flood insurance, subsidy, and incentive, and finally, a proposed research strategy. (Bell-Cornell)
W77-05188

PROBLEMS AND POSSIBILITIES IN URBAN DRAINAGE,
Nova Scotia Technical Coll., Halifax. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-05248

EVALUATING WATER QUALITY IMPACTS OF SMALL STREAMS ON MAJOR URBAN RIVERS,
Hydroscience, Inc., Westwood, N.J.
For primary bibliographic entry see Field 5C.
W77-05249

A CHARACTERIZATION OF URBAN STORMWATER RUNOFF IN BOULDER, COLORADO,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-05369

POLLUTIONAL CHARACTERISTICS OF URBAN SNOWMELT RUNOFF,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-05370

CONSUMER EVALUATION OF THE QUALITY AND COST OF DOMESTIC WATER,
California Univ., Berkeley, School of Public Health.
For primary bibliographic entry see Field 5G.
W77-05371

THE DIRECT FILTRATION PROCESS AND ITS APPLICATION TO SYDNEY'S WATER SUPPLY,
Camp Scott Furphy Pty. Ltd., Sydney (Australia).
For primary bibliographic entry see Field 5F.
W77-05527

WATER RE-USE IN JAPAN,
Water Reuse Promotion Centre, Tokyo (Japan).
For primary bibliographic entry see Field 5D.
W77-05528

3E. Conservation In Industry

THE REUSE OF WATER IN COMMERCIAL RAISING OF CATFISH - PHASE TWO,
Memphis State Univ., Tenn. Dept. of Biology.
For primary bibliographic entry see Field 5D.
W77-05103

SEAMALERT, CURRENT SURFACE-MINED RECLAMATION LITERATURE ALERTING SERVICE.
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 5G.
W77-05373

AN APPROACH TO EFFLUENT TREATMENT IN THE FOOD INDUSTRY,
For primary bibliographic entry see Field 5D.
W77-05504

3F. Conservation In Agriculture

OPTIMAL USE OF WATER AND RELATED RESOURCES FOR DIVERSIFIED FARMING ON OAHU, HAWAII: A HYPOTHETICAL STUDY,
Hawaii Univ., Honolulu. Water Resources Research Center.
Y-S. Fok.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 230, Price codes: A03 in paper copy, A01 in microfiche. Technical Memorandum Report No 50, June 1975. 43 p, 6 fig, 10 tab, 7 ref, 5 append. OWRT B-033-HI(1). 14-31-0001-4011.

Descriptors: *Hawaii, *Computer programs, Systems analysis, Water requirements, Agriculture, *Linear programming, *Water utilization, *Optimization.
Identifiers: *Diversified farming, Oahu(Hawaii), Fortran IV.

Diversified farming represents one of many hypothetical alternatives in possible future agriculture patterns and land use on Oahu. Urbanization problems involved in the land use changes from agriculture into urban were not a part of the scope of this study. Major objectives were: (1) to formulate an objective function and its constraints for the variables involved in diversified farming in the southwest region of Oahu, and (2) to show that the objective function and its constraints can be solved by the technique of linear programming. Using the population projection for Oahu, 1970-2020, made by the Board of Water Supply, City and County of Honolulu, projections on available farm land, water, labor, and crops were made and benefit-cost analyses for diversified crops were performed for the study area. Once the coefficients and limitations of the objective and the constraint functions were determined, the study problem was solved by the linear programming method. The computer program for the linear programming solutions was written in detail in Fortran IV language. Results indicated that (1) diversified farming in the study area should generate profits from selected vegetable crops for which local demand exists, and (2) the linear programming technique can be applied to obtain optimal solutions for problems involved in diversified farming.
W77-05105

LOW-FLOW FREQUENCY AND STOCHASTIC ANALYSIS OF IRRIGATION DITCH FLOWS FOR CENTRAL MAUI, HAWAII, FINAL REPORT,
Hawaii Univ., Honolulu. Water Resources Research Center.
Y-S. Fok, and C. S. Miyasato.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 192, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No 99, November 1976. 32 p, 11 fig, 1 tab, 13 ref, append. OWRT A-055-HI(1). 14-31-0001-5011.

Descriptors: *Droughts, Water resources, Management, *Irrigation ditches, *Stochastic processes, *Hawaii, Irrigation water, *Low-flow frequency, *Water management(Applied).
Identifiers: Central Maui(Hawaii).

The central portion of the island of Maui, state of Hawaii, suffered from droughts during the summers of 1971 to 1975, which resulted in heavy crop losses. In order to learn more about the frequency of droughts, a study of the irrigation water low-flow frequency was made, and a set of low-flow frequency curves for the central Maui area was prepared and is presented. Low-flow frequency curves can only provide the probability of occurrence of a drought in terms of a given magnitude of flow, its duration and its recurrence interval; therefore, their applicability is limited to an event basis, and the sequential characteristics of the droughts are not provided. In order to study the drought occurrence on an event-sequence basis, with the aim to explore the water manageability during a drought, a stochastic analysis of the low flows in the summer periods of the central Maui region was conducted. The methods and results of the stochastic analysis are presented. Most of the irrigation water is collected and delivered by ditches to the central Maui sugarcane fields; among these ditches, the Wailoa ditch delivers about 90% of the summer months' irrigation water. Therefore, the Wailoa ditch monthly flow recorded by U.S. Geological Survey for 1923 to 1972 has been used for the stochastic analysis of the summer low flows. The results obtained show very little improvement from using Pearson Type III distribution against the normal distribution of the random error term in the stochastic simulation of the summer ditch flows. Four sets of summer ditch flows for the period 1974-2020 have been generated and presented for water management references.
W77-05106

OPTIMUM CONTROL OF IRRIGATION WATER APPLICATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. M. Fogel, L. Duckstein, and C. C. Kisiel.
Journal of Hydrology, Vol. 28, No. 2/4, p 343-358, February 1976. (Published in Amsterdam) 4 fig, 17 ref. OWRT B-032-ARIZ(26).

Descriptors: *Irrigation water, *Management, Farms, *Mathematical models, *Decision making, Soil water, Hydrologic aspects, Stochastic process, Water costs, Methodology, Equations, *Optimization, Systems analysis, Forecasting.
Identifiers: *Inventory models, Water application.

Managing farm irrigation systems involves the choice of method, time, and quantity of irrigation water application. This paper focuses on the problem of continuous or periodic review of the factors that affect crop production (i.e., climate), that is, making decisions based on relatively short-term predictions. Finding the optimal irrigation policy is examined using a new approach based on the idea that an analogy exists between a business that stocks physical goods and a farm irrigation system in which the soil is a reservoir that stores water for future use by the plant. The demand on this reservoir may be either deterministic or stochastic. It is shown that inventory models can be adapted to the decisions involving the efficient operation of such farm irrigation systems. (Bell-Cornell)
W77-05193

WATER USE AND PRODUCTIVITY OF WHEAT UNDER FIVE IRRIGATION TREATMENTS,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
C. F. Ehlig, and R. D. LeMert.
Soil Science Society of America Journal, Vol. 40, No. 35, p. 730-755, 1976. 6 fig., 1 tab., 11 ref.

Descriptors: *Soil-water-plant relationships, *Irrigation praction practices, *Soil management, Irrigation efficiency, Water requirements, Plant growth, Evapotranspiration, *Water utilization, *Wheat, Grains(Crops), Yield equations, Crop production.

Water use efficiency, growth, and productivity of wheat were examined to determine if irrigated wheat yield could be increased by limiting water applications during the growing season. Irrigation water was applied to wheat planted in a clay loam soil at 5 rates from 11% more to 23% less than evapotraspiration (ET). Water use decreased significantly, from 677 to 540 mm, with each successive decrease in water application frequency. Applying less water than ET did not increase water use efficiency. At the three driest treatments yield decreased proportionately with water use, though grain yield in all treatments was relatively high. A relationship between grain yield (Y) and water use (X) was characterized by the equation, Y= -9548 + 46.42X -0.06866X to the second power + 0.00003390X to the third power. Seed weight was unaffected by irrigation treatment and cumulative total dry weight was similar on all treatments for the first 120 days. These results suggest that (1) soil water managemet practices should avoid even slight plant water deficits at the jointing stage in order to achieve maximum yield, (2) the practice of withholding water from winter-grown wheat may hasten heading and grain maturity and decrease yield of new nonlodging wheat varieties, and (3) in areas with negligible rainfall, irrigation should be scheduled to replace water used for ET. (Luedtke-Wisconsin).
W77-05221

METHOD FOR EVALUATING IRRIGATION PROJECTS,
Economic Research Service, Washington, D.C. Natural Resource Economics Div.
H. C. Hogg, and G. R. Vieth.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. IR1, Proc. Paper No. 12828, p 43-52, March 1977. 2 fig, 3 tab, 9 ref.

Descriptors: *Irrigation, *Project feasibility, *Project planning, *Evaluation, *Crop production, *Return(Monetary), Agriculture, Cost-benefit ratio, Evapotranspiration, Prices, Variability, *Methodology, Water distribution(Policy), Optimization, Equations, Systems analysis, Mathematical models, Risks, Evaporation pans, Hawaii.
Identifiers: Present worth, Water production, Sugar plantations, Honokaa Plantation(Hawaii).

A methodology is presented for evaluating irrigation projects by comparing the performance of alternative system designs over a planning period specified by the user. The estimating model is based on a universal crop production function for water which is utilized to optimize interzonal water distribution. A solution is optimum if: (1) the value of product resulting from the last unit of water applied divided by the marginal cost of water (in this case the unit cost) is the same for all zones; (2) the value of product for the last unit of irrigation is not less that its cost; (3) there can be no negative irrigation levels, i.e., the interzonal transfer of rainfall; and (4) the total amount of irrigation water applied does not exceed the quantity available. Project zones are defined by climate, soil, and crop produced. Price and climatic uncertainty are dealt with directly in the model assuming the probability distribution of the respective varible is known. The measures of economic viability available for comparing alternative system designs include: the benefit/cost ratio , internal rate of return, and net present worth. Presented is an illustrative example--a single sugar plantation occupying multiple climatic zones and operating under conditions of price and climatic uncertainty. (Bell-Cornell)
W77-05237

MINIMIZING CANAL CAPACITY FOR IRRIGATED RICE,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
R. E. Hagan, and J-K. Wang.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. IR1, Proceedings paper No. 12821, p 71-78, March 1977. 3 fig, 3 ref.

Descriptors: *Canal design, *Irrigation, *Rice, *Conveyance structures, Rotational flow, Efficiencies, *Surface irrigation, Water demand, Equations, Systems analysis.
Identifiers: *Capacity(Canals).

Improved formulas are developed for calculating the maximum canal or pump capacity needed for lowland rice rotational irrigation system design. The conventional and modified conventional formulas are derived from assumptions that cannot be satisfied during irrigation system operation. This induces water usage and management inefficiencies into the system. Analysis of the conventional and modified conventional formulas with the rotational irrigation system management practices isolates several criteria to be used in integrating design and operation. By this integration, irrigation system efficiency is increased. The maximum capacity given by the improved formulas is smaller than that required by the conventional and modified conventional formulas. This allows the use of smaller canals or an enlargement of the area, or both, serviced by a given water supply flow rate. (Bell-Cornell)
W77-05239

OPTIMAL CROPPING PATTERN FOR BASIN IN INDIA,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
V. Lakshminarayana, and S. P. Rajagopalan.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 103, No IR1, Proceedings paper No 12803, p 53-70, March 1977. 4 fig, 15 tab, 6 ref.

Descriptors: *Crops, *Canals, *Groundwater, *Linear programming, *Surface waters, Conjunctive use, Water utilization, Optimization, Equations, Economics, Hydrologic data, Operating costs, Drainage, Constraints, Mathematical models, Systems analysis.
Identifiers: *India, Alluvial deposits, Sensitivity analysis, Simplex method, Water release, Tubewells, Benefit maximization, *Cropping patterns.

Optimization techniques can be used for finding cropping patterns for an agricultural land. An alluvial tract between two rivers in northern India is considered for such a study. Total water resources of the basin, i.e., ground and surface water, are used in determining an optimal cropping pattern and an optimal water release policy from canals and tubewells during various months in a year for maximizing the net benefits, utilizing linear programming. Sensitivity analysis is carried out by varying the parameters that affect the optimal solution such as quantity of groundwater pumped, area irrigated, operating costs of canals and tubewells, a fixed variation in the rainfall, and value of crops. The model has been applied to the Bari Doab Tract in Punjab. It is found that with increase in area available, a reduction of irrigated area occurs for rice and wheat, more pronounced in the case of rice. This is due to the fact that the model does not include a minimum constraint for the irrigated area of individual crops. The model has all input data in deterministic form; it is necessary for future studies to include the stochastic character of these variables, as well as constraints on water quality. (Bell-Cornell)
W77-05240

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, JOHN DAY DRAINAGE BASIN.
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W77-05285

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, DESCHUTES DRAINAGE BASIN.
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W77-05286

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS. HOOD DRAINAGE BASIN,
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W77-05298

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, WILLAMETTE DRAINAGE BASIN,
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W77-05299

AGRICULTURE AND CLEAN WATER (PROCEEDINGS OF A CONFERENCE ON AGRICULTURAL WATER POLLUTION CONTROL),
Midwest Research Inst., Kansas City, Mo.

For primary bibliographic entry see Field 5G.
W77-05305

WORKSHOP FOR AN ASSESSMENT OF THE PRESENT AND POTENTIAL ROLE OF WEATHER MODIFICATION IN AGRICULTURAL PRODUCTION,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W77-05310

TRICKLE IRRIGATION DESIGN,
D. Karmeli, and J. Keller.
Rain Bird Sprinkler Manufacturing Corporation, Glendora, California. 1975. 133 p.

Descriptors: Irrigation, *Irrigation systems, Irrigation practices, Irrigation efficiency, Crop response, Soil water movement, Hydraulics, Design, *Irrigation design, Reviews.
Identifiers: *Trickle irrigation, *Drip irrigation.

This text provides a complete review of trickle irrigation with sufficient handbook material and instruction for system design. It has been written with the student engineer, research and adviser, as well as existing and potential users, in mind. Text is written with both metric and English units of measurement. (Skogerboe-Colo St)
W77-05311

RECYCLING AGRICULTURAL RUNOFF,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-05333

RECYCLING OF SEWAGE EFFLUENT BY IRRIGATION: A FIELD STUDY ON OAHU, FINAL PROGRESS REPORT FOR AUGUST 1971 TO JUNE 1975.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W77-05372

EVAPORATION REDUCTION FROM SOIL WITH WHEAT, SORGHUM, AND COTTON RESIDUES,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 2D.
W77-05435

SHALLOW SUBSURFACE DRAINAGE-FIELD PERFORMANCE,
Agricultural Research Service, Columbus, Ohio. North Central Region.
For primary bibliographic entry see Field 4A.
W77-05441

DISAPPEARANCE AND MIGRATION OF PROPANIL AND ITS METABOLITE 3,4-DICHLORANILINE IN AN IRRIGATED LANDSCAPE, (IN RUSSIAN),
Akademiya Nauk SSSR, Pushchino. Inst. of Agrochemistry and Soil Sciences.
For primary bibliographic entry see Field 5B.
W77-05495

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

MULTIPLE USE IN SOUTHERN APPALACHIAN HARDWOODS--A 10-YEAR CASE HISTORY,
Southeastern Forest Experiment Station, Franklin, N.C. Coweeta Hydrologic Lab.
J. E. Douglass, and W. T. Swank.
In: XVI IUFRO World Congress, June 20-July 2, 1976, Oslo, Norway, Blindern Campus, University of Oslo, University of Oslo Congress Service, Blindern, Oslo, Norway, p 425-436. 5 fig, 2 tab, 12 ref.

Descriptors: *Multiple purpose projects, *Timber management, *Watershed management, *Wildlife management, *Recreation management, *Water quality, Appalachian Mountains region, *North Carolina, Watersheds(Basins), Forest watersheds.
Identifiers: Southern Appalachian Mountains.

The multiple-use concept of managing hardwood forests in the southern Appalachians for timber, water, wildlife, and recreation was pilot-tested on a 144-ha watershed in western North Carolina. Water, timber, and wildlife objectives of management were achieved, and responses of these resources during the first 10 years of management are discussed. Log dams designed to create riffles and pools caused the greatest conflict with other objectives by increasing turbidity of water, causing excessive channel and bank cutting, and probably adversely affecting trout, at least temporarily. (Forest Service)
W77-05112

SNOW ACCUMULATION AS RELATED TO METEOROLOGICAL, TOPOGRAPHIC, AND FOREST VARIABLES IN CENTRAL SIERRA NEVADA, CALIFORNIA,
Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
For primary bibliographic entry see Field 2C.
W77-05113

HYDROGRAPH ANALYSIS: A COMPUTERIZED SEPARATION TECHNIQUE,
Intermountain Forest and Range Experiment Station, Moscow, Idaho.
N. Bethlahmy.
Intermountain Forest and Range Experiment Station, Ogden, Utah, USDA Forest Service Research Paper INT-122, 1972. p 1-19, 3 fig, 8 tab.

Descriptors: *Computer programs, *Hydrograph analysis, *Flood forecasting, Runoff.

Described is a computer program (Fortran IV language) designed to analyze hydrographs. Using only input data of stage and time, the program automatically determines the beginning and end of each event, analyzes each event with respect to all its hydrologic characteristics (including a partitioning of base flow, interflow, and rapid flow), and then prints a detailed analysis of each event and a series of summaries of all events analyzed. The hydrologist can influence the results only by changing the time interval between hydrograph readings. The method has been tested on both simple and complex hydrographs representative of runoff events in many regions of the United States. (Forest Service)
W77-05117

NOISE ABATEMENT IN A PINE PLANTATION,
Northeastern Forest Experiment Station, Syracuse, N. Y.
R. E. Leonard, and L. P. Herrington.
USDA Forest Service Research Note NE-140, 1971, p. 1-6, 2 fig., 1 tab., 2 ref.

Descriptors: Forests, Vegetation, Pine trees, Measurement, *Red pine trees, *Forest management.
Identifiers: *Sound abatement(Forests), *Sound attenuation(Forests).

Observations on sound propagation were made in two red pine plantations. Measurements were taken of attenuation of prerecorded frequencies at various distances from the sound source. Sound absorption was trongly dependent on frequencies. Peak absorption was at 500 Hz. (Forest Service).
W77-05122

STOCHASTIC MODELLING OF THE EFFECTS OF RESERVOIR OPERATION,
Waterloo Univ. (Ontario), Dept. of Systems Design.
K. W. Hipel, A. I. McLeod, and E. A. McBean.
Journal of Hydrology, Vol. 32, No. 1/2, p 97-113, January 1977. 9 fig, 2 tab, 9 ref.

Descriptors: *Stochastic processes, *Model studies, *Reservoir operation, *Canada, Hydrology, Reservoirs, Statistical models, Statistical methods, Monthly, Seasonal, Mathematical studies.
Identifiers: Gardiner Dam(Canada), *Stochastic modeling, *South Saskatoon River, Intervention analysis, Stochastic technique, Transfer function, Confidence intervals, ARIMA model, Hydrology time series.

Reservoir operation often can alter significantly the mean level of the monthly average flows downstream from a dam. For instance, flows may be increased downstream from the dam during a previous dry season before, reservoir construction, and flows may be decreased when there is abundant runoff. Intervention analysis is a stochastic technique that can be used to model and to describe statistically the effects of reservoir operation on the seasonal average downstream flows. The mathematical theory of intervention analysis was explained, followed by the identification, estimation, and diagnostic check stages of model development. An intervention model was developed to model the effect of the operation of the Gardiner Dam on the downstream average monthly flows of the South Saskatchewan River at Saskatoon, Canada. It was shown how the percentage changes in mean flows are calculated from the estimated transfer function parameters. Because the standard errors are known for the estimated parameters, confidence intervals for the flow changes can also be obtained. (Lee-ISWS)
W77-05145

OVERLAND-FLOW TRAVEL TIME VERSUS REYNOLDS NUMBER,
University of Southern California, Los Angeles. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-05149

COMPARATIVE CLIMATIC ANALYSIS OF LOWER MISSISSIPPI RIVER FLOODS: 1927, 1973, AND 1975,
Louisiana State Univ., Baton Rouge. Dept. of Geography and Anthropology.
For primary bibliographic entry see Field 2E.
W77-05158

LINK LENGTH ORGANIZATION AND NETWORK SCALE DEPENDENCIES IN THE NETWORK DIAMETER MODEL,
State Univ. of New York at Buffalo. Dept. of Geography.
R. S. Jarvis.
Water Resources Research, Vol. 12, No. 6, p 1215-1225, December 1976. 4 fig, 3 tab, 13 ref.

Descriptors: *Drainage patterns(Geologic), *Tributaries, *Networks, *Drainage, Streams, Rivers, Runoff, Measurement, Length, Data processing, Analytical techniques, Correlation analysis, Distribution patterns, Geomorphology, Hydrology.
Identifiers: *Stream morphology.

Analyses of stream link lengths drawn from drainage networks defined by Strahler order or by magnitude have generally failed to reveal any evidence of organization or covariation between interior and exterior link lengths. Classifying networks by maximum source height or diameter reveals that link length organization is network scale dependent, may not appear significant for small-magnitude headwater systems, and is environmentally sensitive to spatial scale threshold constraints. Empirical analyses of networks from two contrasting geomorphic environments revealed that link length organization can be regionally discriminatory and can also differentiate between network states defined by blue lines and valley systems on 1:25,000 topographic sheets. Link lengths were derived by using an automatic digitizer. These results constitute the largest data set of individual link length measurements reported to date. (Sims-ISWS)
W77-05161

AN APPLICATION OF COMPUTER GRAPHICS TO ANALYSIS OF EXTREMES,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 2E.
W77-05164

THE EFFECTS OF DIURNAL MIXING ON THERMAL STRATIFICATION OF STATIC IMPOUNDMENTS,
Arizona State Univ., Tempe. Dept. of Mechanical Engineering.
R. I. Hirshburg, J. S. Goodling, and G. Maples.
Water Resources Bulletin, Vol. 12, No. 6, p 1151-1159, December 1976. 2 fig, 13 ref. OWRT A-031-ALA(3).

Descriptors: *Impoundments, *Reservoirs, *Mixing, *Thermal stratification, Diurnal, Radiation, Solar radiation, Stratification, Epilimnion, Model studies, Mathematical models, Convection, Energy transfer, Heat transfer, Temperature, Water temperature, Limnology.
Identifiers: *Diurnal mixing, Diurnal variations, Thermal mixing.

The time variation in the temperature distribution of a static water impoundment was predicted. The body of water was modeled as a discrete number of horizontally isothermal layers, and the energy equation was solved using an implicit numerical scheme. Vertical energy transport mechanisms included were solar absorption, molecular diffusion, and convective mixing due to nocturnal turnover. The latter mechanism, called diurnal mixing, was found to have a profound effect on the stratification, particularly in the epilimnion patterns for a typical deep static impoundment. (Sims-ISWS)
W77-05172

MODELING MONTHLY HYDROLOGIC PERSISTENCE,
Catholic Univ. of America, Washington, D. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-05177

A VARIABLE SOURCE AREA MODEL OF THE RAINFALL-RUNOFF PROCESS BASED ON THE WATERSHED STREAM NETWORK,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-05178

AN EVALUATION OF THE PRACTICALITY AND COMPLEXITY OF SOME RAINFALL AND RUNOFF TIME SERIES MODELS,
Purdue Univ., Lafayette, Ind. School of of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-05179

TILE DRAINAGE IN BEDDED SOIL OR A DRAW,
Iowa State Univ., Ames. Dept. of Agronomy.
N. L. Powell, and D. Kirkham.
Soil Science Society of America Journal, Vol. 40, No. 5, p 625-630, September-October 1976. 5 fig, 1 tab, 24 ref. OWRT A-044-IA(5), NSF Eng 75-19394.

Descriptors: *Tile drainage, *Furrow drainage, *Drainage practices, Drainage systems, Farm management, Drainage, Tiles, Subsurface drainage, Potential flow, Seepage, Model studies, Mathematical models, Drainage engineering, Agricultural engineering, Agriculture.

The process of shaping flat land by plowing it into a series of ridges separated by parallel dead furrow is called 'bedding', and the ridge-furrow systems are called 'beds(. The furrows are supposed to remove surface water from the ridges, but often do not. In this paper, the amount of water that can be removed by tiles if they are placed under the furrows was computed on the basis of Darcy's law and potential theory. In the analysis, water-saturated, steady-state conditions and a subsurface barrier on which the drain tiles are laid were assumd. For a poorly drained prairie soil, the calculations showed that tiles (or plastic tubes, etc.) placed 0.35 m below the furrow bottoms and 30 m apart in beds of 2% slope will remove 5 mm of water/day. Also, the bed furrows would have to remove an additional 4.52 mm/day to take care of an expected drainage coefficient of 9.52 mm/day. For general use, 28 depth and spacing geometries were analyzed and tabulated for amounts of flow-to-tile in the beds. For certain geometries, some of the recharge rainfall seeps in and out of the ridge slope before the water seeps down again into the soil. This in and out seepage occurs for small tile depths and for small tile sizes. Flow nets were presented. It was shown that the theory applies to the drainage of a draw. (Sims-ISWS)
W77-05181

A NORTHERN SNOWMELT-FLOOD FREQUENCY MODEL,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2E.
W77-05186

OPTIMUM CONTROL OF IRRIGATION WATER APPLICATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 3F.
W77-05193

MODIFICATION OF COASTAL WETLANDS IN SOUTHEASTERN MICHIGAN AND MANAGEMENT ALTERNATIVES,
Eastern Michigan Univ., Yipsilanti.
E. Jaworski, and C. N. Raphael.
Michigan Academician, Vol 8, No 3, p 303-317, 1976. 8 fig, 1 tab, 7 ref.

Descriptors: *Lake shores, *Michigan, *Wetlands, *Marshes, *Preservation, *Shoreline cover, *Lake Erie, Coastal marshes, Land management, Conservation, Natural resources, Shore protection, Shores, Mud flats, Land use, Great Lakes.
Identifiers: *Lake St Clair(Mich).

Two extensive areas of coastal wetlands in Michigan, on the west shorelines of both Lake St. Clair and Lake Erie, are characterized by marshes that have undergone significant modification over the past century. To demonstrate this modification, a series of maps were constructed that depict the historical changes in the wetlands. Data was collected through analysis of aerial photographs and lake survey charts as well as from field studies. A graphic illustration is provided of two vegetation transects on the lower St. Clair delta, showing changes in a 27-month period from 1972 to 1974, and maps of Lake St. Clair in 1873 and 1973 show overall diminuition of marsh areas. Data descriptions are also given individually for wetland modifications on the coast of Lake Erie, on North Maumee Bay, the Raisin River and Pointe Mouillee. Four measures are advised for preserving the coastal wetlands: (1) Allow the marsh communities to migrate landward or lakeward in response to fluctuating lake levels; (2) dike the wetlands to maintain desired vegetation communities; (3) nourish barrier and transgressive beaches to provide protection from storm waves and seiches; and (4) purchase wetland areas to prevent alteration or destruction by private land usages. (Harris-Wisconsin)
W77-05217

MINIMIZING CANAL CAPACITY FOR IRRIGATED RICE,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-05239

OPTIMAL CROPPING PATTERN FOR BASIN IN INDIA,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3F.
W77-05240

THE CONTROL OF A MULTIPURPOSE RESERVOIR,
Trinity Coll., Dublin (Ireland).
J. Haslett.
Advances in Applied Probability, Vol 8, No 3, p 592-609, September 1976. 1 tab, 5 ref.

Descriptors: *Multiple-purpose reservoirs, *Reservoir operation, *Control, *Water policy, *Optimization, *Numerical analysis, Costs, Assessment, Dams, Behavior, Stochastic processes, Reservoir releases, Decision making, Probability, Systems analysis, Equations.
Identifiers: *Cost minimization, Weiner process, Discounted costs, Renewal theory, Laplace transforms, Equilibrium distribution.

A technique known as potential cost, used by Faddy for assessing the operation of a dam, is shown to be capable of extension to allow for: (1) a very general cost function, as is required for a multipurpose reservoir; and (2) the use of discounting of future costs. Numerical results are obtained for an optimal (least-cost) policy based on such an assessment and demonstrate the need for an accurate specification of the costs associated with the operation of a reservoir. As a by-product, a very full description of the steady-state stochastic behavior of the dam is obtained. (Bell-Cornell)
W77-05241

A STOCHASTIC POINT-PROCESS MODEL FOR THE OCCURRENCE OF MAJOR FREEZES IN LAKE CONSTANCE,
Byk Gulden Research Centre, Konstanz (West Germany).
For primary bibliographic entry see Field 2C.
W77-05242

A COMPARISON BETWEEN A MONTHLY SIMULATION AND AN ANNUAL MORAN MODEL OF VAAL DAM,
Natal Univ., Durham (South Africa). Dept. of Civil Engineering.
G. G. S. Pegram.
The Civil Engineer in South Africa, Vol 18, No 6, p 131-133, June 1976. 2 fig, 10 ref.

Descriptors: *Simulation analysis, *Reservoirs, *Dams, *Probability, *Reliability, *Water supply, Methodology, Storage, Annual, Monthly, Flow, Mathematical models, Systems analysis, Africa.
Identifiers: *Vaal Dam(U of S Africa), Comparison, Sensitivity.

Simulation is probably the most popular method used to analyze reservoir performance, i.e., to ascertain the risk of failure to supply full demand. Another method which is not as widely used is a probabilistic model based on discrete Markov Chains which was first proposed by Moran and extended to the case of serially-correlated inflows by Lloyd. This paper compares the two methods of analysis and highlights advantages and disadvantages of each relative to the other when applied to a practical storage analysis. The reservoir used in this study is Vaal Dam, which forms part of the Vaal-Bloemhof system (Union of South Africa) that is soon to be augmented by water from the Tugela River via the Sterkfontein Dam. Vaal Dam is treated in isolation purely for the purpose of comparing the models. It is concluded that the Moran model is an independent, fast, and accurate approach which can be used with advantage as an adjunct to simulation to solve problems concerning the reliability of single reservoirs. (Bell-Cornell)
W77-05243

OPTIMIZATION OF WATER PUMPING COSTS BY HIERARCHICAL METHODS,
Sheffield Univ. (England). Dept. of Control Engineering.
For primary bibliographic entry see Field 6C.
W77-05245

MINIMUM COST DESIGN USING A PRE-PLANNED NODAL SEARCH METHOD,
V. P. Lane, and H. Harriman.
Proceedings of the Institution of Civil Engineers, Vol. 59, Part 2, p 237-253, June 1975. 9 fig, 3 tab, 10 ref, append.

Descriptors: *Reservoir design, *Optimization, *Methodology, Economic efficiency, Costs, Projects, Civil engineering, Concrete, Numerical analysis, Effects, Constraints, Roofs, Algorithms, Computers, Systems analysis.
Identifiers: *Cost minimization, *Nodal search method, Cost design.

This paper considers the incorporation into the design process of techniques to achieve the minimum cost design. In civil engineering, it is common for the designer to be limited to solutions formed by sets of discrete sized omponents as opposed to the situation in which functions are of a continuous nature. This article shows the merit of applying a method of selection which incorporates the knowledge possessed by the experienced engineer of the effect on the problem of the discrete sizes of the components. To illustrate the simplicity and effectiveness of this experience-oriented pre-planned nodal search method, it is compared with a method which ignores the discrete nature of the civil engineering problem and assums a continuous spectrum of design options. The nodal method is then applied to the synthesis of reinforced concrete reservoir design and the advantages and difficulties of incorporating optimization in the design process are discussed. (Bell-Cornell)
W77-05246

DECOMPOSITION OF WATER DISTRIBUTION NETWORKS,
Illinois Inst. of Tech., Chicago.
T. W. Knowles, I. Gupta, and M. Z. Hassan.
American Institute of Industrial Engineers, Vol. 8, No. 4, p 443-448, December 1976. 3 fig, 2 tab, 15 ref.

Descriptors: *Water distribution(Applied), *Networks, *Pipelines, *Linear programming, Water supply, Economic efficiency, Optimization, Demand, Constraints, *Head loss, Computers, Equations, Mathematical models, Systems analysis, *Algorithms.
Identifiers: *Parametric programming, *Cost minimization, Pipe diameter, Sub-networks, Problem decomposition.

Various mathematical and computer algorithms have been developed to solve water distribution system problems, including the use of linear, nonlinear and dynamic programming, as well as the decomposition principle followed by simultion of submodels. However, it is clear that there is no viable method for optimizing large and complex networks. Discussed are the disadvantages of existing methods, and methodology is presented for solving large networks using parametric linear programming. Considered is how the problem can be treated in stages, where each stage is optimized separately and then combined. For a fixed pipeline configuration or tree, the approach yields a global optimum--selects the pipe diameters of that configuration at least cost while satisfying customer demands. The use of this methodology to decompose a large problem into several smaller problems will increase the size of problems that can be considered by allowing decentralized model building and reduced computer times. (Bell-Cornell)
W77-05251

IMPACTS OF STATE LAND USE AND ENVIRONMENTAL REGULATIONS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 6G.
W77-05256

A GUIDE FOR THE GEOLOGIC AND HYDROLOGIC EVALUATION OF SMALL LAKES SITES IN MISSOURI,
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 8D.
W77-05260

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W77-05263

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 3. SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER,
Geological Survey, Menlo Park. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05264

LOW-FLOW CHARACTERISTICS OF STREAMS ON THE KITSAP PENINSULA AND SELECTED ADJACENT ISLANDS, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-05273

FLOOD OF JUNE 27, 1975, IN CITY OF AMES, IOWA,
Geological Survey, Iowa City, Iowa. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-05276

RESPONSE OF GROUND-WATER LEVELS TO FLOOD CONTROL OPERATIONS IN THREE BASINS, SOUTHEASTERN FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-05278

QUALITY-OF-WATER DATA, PALM BEACH COUNTY, FLORIDA 1970-1975,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-05279

HYDROLOGY AND WATER RESOURCES OF THE CHARLES RIVER BASIN, MASSACHUSETTS,
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05280

HYDROLOGIC UNIT MAP--1974, STATE OF NEBRASKA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-05281

HYDROLOGIC UNIT MAP--1974, STATE OF NEW MEXICO.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-05282

WAPSIPINICON RIVER AND MALONE CREEK FLOOD PLAIN INFORMATION, INDEPENDENCE, IOWA.
Army Engineer District, Rock Island, Ill.
Prepared for Iowa Natural Resources Council, June 1972. 67 p, 11 tab, 18 plates, 46 fig.

Descriptors: *Flood control, *Flood plain zoning, *Non-structural alternatives, *Iowa, Building codes, Flood peak, Historic floods, Flood data, Flood damage, Flood plains, Zoning, Flood profiles, Standard Project Flood.
Identifiers: *Wapsipinicon River(IA), *Malone Creek(IA), Independence(IA), Buchanan County(IA), Intermediate Regional Flood.

The study area includes 13 miles of the Wapsipinicon River and 6 miles of Malone Creek. Both waterways flow through Independence, Buchanan County, Iowa. Some residential and commercial establishments rest on or are adjacent to the flood plains. Flow records on the Wapsipinicon are available from July 1933 to date, from the stream gaging station in Independence. There are no flow records available for Malone Creek, but rainfall and runoff data have been collected for the Malone Creek basin since August 1968. Newspaper files and historical documents were searched for information concerning past floods. Major floods occur in the spring and eary summer. They are caused by the spring snow melt, storms, or both. The greatest recorded flood flow on the Wapsipinicon occurred on July 18, 1968, resulting in a flow of 26,800 cubic feet/sec (cfs) and cresting at 9.1 feet above flood stage. On Malone Creek the worst flood occurred on July 16, 1968, resulting in a flow of 10,700 cfs, which is equivalent to the 200 year flood flow. The Intermediate Regional Flood (IRF) would be 6.7 feet higher than the July 18, 1968 flood on the Wapsipinicon, while the Stan-

dard Project Flood (SPF) would be 5 to 6 feet higher than the IRF, and 12.3 feet higher than the July 18, 1968 flood. Although not intended to be a flood control plan, non-structural controls are suggested and described. They include encroachment lines, zoning, subdivision regulations, building codes, and flood plain regulations. (Nessa-NC)
W77-05284

MISSISSIPPI RIVER FLOOD PLAIN INFORMATION, MILE 506.9 TO MILE 549.4.
Army Engineer District, Rock Island, Ill.
Prepared for Iowa Natural Resources Council and Illinois Department of Transportation, June 1973. 40 p, 6 tab, 17 plates, 18 fig.

Descriptors: *Flood control, *Flood peak, *Flood data, Historic floods, Flood plains, *Illinois, *Iowa, *Mississippi River, Standard Project Flood.
Identifiers: Whiteside County(IL), Carroll County(IL), Clinton County(IA), Jackson County(IA), Albany(IL), East Clinton(IL), Fulton(IL), Savanna(IL), Camanche(IA), Clinton(IA), Sabula(IA), Intermediate Regional Flood.

The study area includes the area subject to flooding by the Mississippi River in Carroll and Whiteside Counties, IL, and parts of Clinton and Jackson Counties, IA. The area includes the communities of Albany, East Clinton, Fulton and Savanna, IL; and Camanche, Clinton, and Sabula, IA. Both urban and rural property have suffered moderate to severe damage in past floods. Stream gage data dating back to 1888 were used. Newspaper files and historical documents provided supplementary information. The main flood season is during the early spring snowmelt, although heavy rains have caused large floods. The highest flood of record occurred on April 27, 1965, cresting at 24.85 feet and discharging 307,000 cubic feet/sec (cfs) at Clinton, IA. The Intermediate Regional Flood is expected to discharge 339,000 cfs at Clinton, while the Standard Project Flood would discharge 460,000 cfs at the same site. The potential damage caused by these floods will greatly increase in the future if development in the flood plain continues at its present pace. Projected damages range from inundation of open space to destruction of buildings and loss of life. (Nessa-NC)
W77-05287

KISHWAUKEE RIVER FLOOD PLAIN INFORMATION, WINNEBAGO COUNTY, ILLINOIS.
Army Engineer District, Rock Island, Ill.
Prepared for Illinois Department of Transportation, June 1973. 32 p, 8 tab, 10 plates, 24 fig.

Descriptors: *Flood data, *Flood control, *Historic floods, Flood peak, Flood plains, *Illinois, Standard Project Flood.
Identifiers: *Kishwaukee River(IL), South Branch Kishwaukee River(IL), Morristown(IL), New Milford(IL), Cherry Valley(IL), Winnebago County(IL), Intermediate Regional Flood.

The study area includes the Kishwaukee River and South Branch Kishwaukee River flood plains in Winnebago County, Illinois. Some residential and commercial developments in the villages of Cherry Valley, New Milford and Morristown lie on or are adjacent to the Kishwaukee flood plain. Extensive future development in both flood plains is expected. Stream gages have been maintained on both rivers since 1939. Supplementary data were obtained from newspaper files and historical documents. The main flood season is in winter or spring, resulting in snowmelt, rainfall, or both. Bridges are natural barriers to flood flows, causing ice, log, and debris jams. The worst flood on the Kishwaukee River occurred on January 6, 1948, cresting at 19.5 feet above flood stage and discharging 16,400 cubic feet/sec (cfs). On the South Branch Kishwaukee River the worst recorded flood occurred on January 5, 1946, cresting at 9.35 feet above flood stage and discharging 6,840 cfs. In the study area as a whole the Intermediate Regional Flood (IRF) would crest at 14.7 feet, and the Standard Project Flood (SPF) would crest at 24.8 feet. The IRF and SPF would inundate residential and commercial areas. Deep flood water and floating debris would create hazardous conditions. (Nessa-NC)
W77-05288

FLOOD PLAIN INFORMATION REPORT, SKUNK RIVER AND SQUAW CREEK, STORY COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.
Prepared for Iowa Natural Resources Council, June 1966. 27 p, 2 tab, 9 plates, 12 photos.

Descriptors: *Flood control, *Flood plain zoning, *Non-structural alternatives, *Iowa, Building codes, Flood data, Flood damages, Historic floods, Zoning, Standard Project Flood.
Identifiers: *Skunk River(IA), *Squaw Creek(IA), Ames(IA), Story County(IA), Intermediate Regional Flood, Flood plain management.

The Skunk River segment of the study area extends 3.3 miles downstream and 4.9 miles upstream from the River's confluence with Squaw Creek. Four miles of Squaw Creek, up to the confluence with the Skunk River, are also included. The complete study area consists of 568 square miles, in Story County, Iowa, including the city of Ames. The flood plains have not been extensively developed, with only scattered public and commercial developments. Past flood damages have been light. Extensive development is expected with the projected increase in employment opportunities and the growth of the University in Ames. Newspaper files and historical documents were searched for information concerning past floods. The worst flood of record occurred in May 1944, when Ames was completely isolated from surrounding areas by the flood waters, and many basements were flooded due to backed up sewers. Major floods are usually caused by the spring melt, storms, or both. Many bridges crossing the Skunk river serve as accumulation points for debris and ice, inhibiting the flood water's flow. The peak discharge for the Standard Project Flood in the study area of the Skunk River is computed at 35,000 cubic feet/sec (cfs), and for Squaw Creek the estimate is 22,000 cfs. The impact of the Intermediate Regional Flood or the Standard Project Flood will not be severe if future development in the flood plain is restricted. Although not intended to be a flood control plan, non-structural controls are suggested and described. They include encroachment lines, zoning, subdivision regulations, building codes and flood plain regulations. (Nessa-NC)
W77-05289

FLOOD PLAIN INFORMATION REPORT, DUCK CREEK, SCOTT COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.
Prepared for Iowa Natural Resources Council, July 1965. 28 p, 2 tab, 10 plates, 8 photos.

Descriptors: *Flood control, *Flood plain zoning, *Non-structural alternatives, *Flood data, *Iowa, Standard Project Flood, Flood damage, Building codes, Flood peak, Historic floods, Flood plains.
Identifiers: *Duck Creek(IA), Scott County(IA), Davenport(IA), Bettendorf(IA), Flood plain management.

The study area extends from the mouth of Duck Creek at the Mississippi River to 3 miles west of Davenport, IA, and involves 64.5 square miles of land. Extensive residential, commercial and industrial development has taken place in the flood plain in the cities of Davenport and Bettendorf. County records, newspaper accounts and historical documents provide information on past flooding. Floods are generally caused by heavy rain, snowmelt, or both, and they may occur at any time of year. The most severe floods of record on Duck Creek occurred in September 1921, August 1949, March 1960 and March 1963. Damages have included water in many basements, crumbling foundations, destruction of crops, and interrupted utility service. The lack of stream gage records makes the estimation of future flood probability more difficult. High water marks were recovered for certain locations for the flood of August 1949, which crested at 618 feet. The Standard Project Flood is expected to crest at 625 feet. Although not intended to be a flood control plan, nonstructural flood control measures are suggested and described. They include zoning, encroachment lines, subdivision regulations, building codes and flood plain regulations. (Nessa - NC)
W77-05290

SPECIAL WATERSHED PROJECTS.
SEDA Council of Governments, Lewisburg, Pa.
For primary bibliographic entry see Field 4D.
W77-05292

DISASTER RECOVERY PLANNING REPORT.
Pennsylvania Office of State Planning and Development, Harrisburg.
For primary bibliographic entry see Field 6F.
W77-05293

THE GALLATIN AREA; A SUMMARY REPORT,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 6B.
W77-05295

INLAND LAKES WATER QUALITY AND WATERSHED PLANNING: REMOTE SENSING TECHNOLOGY APPLICATIONS,
Michigan Environmental Research Inst., Ann Arbor.
For primary bibliographic entry see Field 6B.
W77-05297

FLOOD PLAIN INFORMATION: SAND AND SLATE CREEKS, NEWTON, KANSAS.
Army Engineer District, Tulsa, Okla.
Prepared for City of Newton, KS, September 1971. 38 p, 9 fig, 15 plates, 6 tab.

Descriptors: *Kansas, *Floods, *Flood profiles, *Flood plains, *Flood protection, Flooding, Regional flood, Flood flow, Streamflow forecasting, Historic floods, Flood data, Peak discharge, Obstructions to flow, Building codes, Zoning, Channel improvement, Dredging, Floodproofing.
Identifiers: *Sand Creek(KS), *Slate Creek(KS), Newton(KS), Standard Project Flood, Intermediate Regional Flood.

Newton is the midwest capitol of the mobile homes industry and has a population of about 16,000. It is a bustling community which is expected to grow. Study areas are devoted to mainly agricultural and residential purposes. Sand Creek with a drainage area of 98 sq mi, originates 12 miles north of Newton and has an average slope of about 4.5 ft/mi in the study reach. Slate Creek, having a drainage area of 5.2 sq mi, rises 2 mi east of Newton and empties into Sand Creek, near the sewage plant in Newton. Its watershed is about 1 mi wide and 5 mi long. Nine floods which caused significant damage occurred between 1902 and 1969, 1965 being the largest flood with a peak discharge of 20,000 cubic feet per second. This flood crested in 9 hours and lasted about 10 hours. Damages were estimated at $2 million. In an Intermediate Regional Flood, peak discharges of 14,6000 cfs and 5,700 cfs are expected on Sand and Slate Creeks, respectively, along with water velocities of up to 6.5 feet per second in the main channel and 1 to 2 ft/sec in overbank areas. During a Standard Project Flood, peak discharges of 8,700 cfs and 28,500 cfs are predicted on Slate and Sand

Creeks respectively and water velocities up to 7 ft/sec. Most of the bridges over Slate Creek are obstructions to flood flow, but the bridges over Sand Creek will have minimal effect on flow. In 1967 the Corps of Engineers completed the Sand Creek Local Protection Project at Newton which consisted of clearing and snagging operations, and widening and deepening some portions of the creek. The project is effective against a 50-year flood, but does not provide complete protection from larger floods. Guidelines are given on zoning and flood plain management. (Smith-North Carolina)
W77-05300

FLOOD PLAIN INFORMATION: LOTTS CREEK AND MILL CREEK, CITY OF STATESBORO, GEORGIA.
Army Engineer District, Savannah, Ga.
Prepared for City of Statesboro, GA. October 1973, 42 p, 26 fig, 35 plates, 5 tab.

Descriptors: *Georgia, *Floods, *Flood profiles, *Flood plains, Flooding, Indirect flood measurement, Streamflow forecasting, Historic floods, Flood data, Flood stages, Peak discharge, Flow duration, Flow characteristics, Flood damage, Erosion, Thunderstorms, Obstructions to flow.
Identifiers: Statesboro(GA), *Mill Creek(GA), *Little Lotts Creek(GA), Standard Project Flood, Intermediate Regional Flood, Bulloch County(GA), Canoochee River(GA), Ogeechee River(GA).

Located within the City of Statesboro, on the divide between the Ogeechee River and the Canoochee River watersheds, the study area has residential, commercial and industrial properties which have been extensively damaged by floods in 1929 and 1964. From 1960 to 1970, population of Statesboro rose about 75% to 14,616 while Bullock County increased 30% to 31,585. As growth continues increased pressure for more development in the floodplains can be expected. Lotts Creek and Little Lotts Creek, which drains most of the city, are tributaries of the Canoochee River. Mill Creek and Mill Creek Tributary, draining the northeastern part of the city, belong to the Ogeechee River system. Average annual rainfall is about 45 inches. Major floods can occur in any season and are caused by heavy rainfall. The area is also susceptible to severe thunderstorms. Predictions of future floods were made on basis of similar watersheds and highwater marks in this area. In an Intermediate Regional Flood (IRF) a peak discharge of 2,100 cubic feet per second and 1,080 cfs are expected on Little Lotts Creek and Mill Creek Tributary, respectively. Water velocities would be from 2 to 7 feet per second in the main channel and .5 to 1 ft/sec in overbank areas. In a Standard Project Flood (SPF) a peak discharge of 5,250 cfs on Little Lotts Creek and 2,700 cfs on Mill Creek Tributary is forecast. Along Little Lotts Creek, the IRF would inundate 610 acres and the SPF, 850 acres. On Mill Creek Tributary 110 acres would be flooded by an IRF and 150 acres by the SPF. Floodwaters rise quickly, in 3-10 hrs along Little Lotts Creek and stay out of banks less than 2 days. Most bridges and culverts would obstruct flood flow. Many buildings, including the sewage treatment plant, would be damaged in both floods. (Smith-North Carolina)
W77-05301

FLOOD PLAIN INFORMATION: NORTH PLATTE RIVER, SCOTTSBLUFF, NEBRASKA.
Army Engineer District, Omaha, Nebr.
Prepared for City of Scottsbluff, February 1975. 38 p, 17 fig, 23 plates, 3 tab.

Descriptors: *Nebraska, *Floods, Flooding, *Flood profiles, *Flood plains, Dams, Reservoirs, Streamflow forecasting, Maximum probable flood, Historic floods, Peak discharge, Flood peak, Flood damage, Snowmelt, Irrigation, Flood plain zoning, Levee, Dikes.
Identifiers: Scottsbluff(NB), *North Platte River(NB), Standard Project Flood, Intermediate Regional Flood.

The floodplain in the vicinity of Scottsbluff contains commercial, residential, recreational, industrial and agricultural development. With a population that increased 7.3% from 1950 to 1970, it is likely that pressure to develop flood prone areas will continue. The North Platte River, a left bank tributary of the Platte River, has a drainage area of 28,500 sq mi above Scottsbluff. However, all but the lower 6,700 sq mi are influenced by Bureau of Reclamation Dams. The floodplain ranges from about 3,500 to 9,000 ft wide. Peak stages on the river generally occur in months March through October. In June high water ocurs because of mountain snowmelt. Since the construction of the upstream reservoirs, flooding has occurred twice, in 1971 and 1973. At Mitchell, NB, flow was measured at 12,200 cubic feet per second in 1971 and 8,370 cfs in 1973. During an Intermediate Regional Flood it is predicted that a peak discharge of 18,500 cfs will occur on the North Platte River. During the Standard Project Flood a peak of 41,500 cfs is anticipated. Fairly extensive areas of urban land would be covered by these events, and water velocities up to 10 ft/sec in the IRF and 14 ft/sec in the SPF could be hazardous, with overbank velocities of 4 ft/sec. These floods would crest 1 to 2.5 days after the beginning of rainfall and last several days. Levees constructed in 1971 provide protection against floods of the magnitude of the 1971 flood. Flood plain zoning regulations have been enacted by both city and county governments. (Smith-North Carolina)
W77-05302

FLOOD PLAIN INFORMATION: AGUA FRIA RIVER, MARICOPA COUNTY, ARIZONA,
Army Engineer District, Los Angeles, Calif.
Prepared for the County of Maricopa, March 1968. 31 p, 12 fig, 32 plates, 4 tab.

Descriptors: *Arizona, *Floods, Flooding, *Flood profiles, *Flood plains, Maximum probable flood, River forecasting, Historic floods, Flood data, Peak discharge, Rivers, Channels, Control structures, Dams.
Identifiers: *Agua Fria River(AZ), Maricopa County(AZ), Waddell Dam(AZ), Standard Project Flood, Intermediate Regional Flood.

The Agua Fria River, which drains 1,459 sq mi above the upper limit of the study reach in Maricopa County, slopes 16.5 ft/mi within the 23 mi study reach. Flood plain ranges from several hundred feet to about 1.7 mi in width and has no concentrated developments. Most of the flood plain is devoted to agriculture. Rapid population growth in adjacent Phoenix metropolitan area will probably result in future development in the study area. Main flood seasons are in winter and summer. Records of river stages and discharges on the river have been kept intermittently since 1910. Prior to the construction of Waddell Dam two floods, in 1916 and 1919, are thought to have been comparable to an Intermediate Regional Flood (IRF) with discharges of 105,000 cubic feet per second. Damages in past floods have been caused to bridges, some structures and railroads. In an IRF a peak discharge of 95,000 cfs is predicted on the river at Camelback Road along with water velocities up to 13.5 cfs in the channel. In a Standard Project Flood a peak discharge of 190,000 cfs is anticipated at the same location with water velocities of 15.1 ft/sec at maximum. Some of the 6 bridges across the river would be obstructive to major flows. No authorized, proposed, or constructed federal flood control or related projects are in the study reach, except for an authorized project in the area where the New River joins the Agua Fria River. (Smith-North Carolina)
W77-05303

ON THE RUN-OFF CHARACTERISTICS IN THE NIGORI RIVER AND OHORA RIVER BASINS CONSIDERED BY THE SURFACE RUN-OFF (HYOMER RYUSHUTSU O KANGAETA NIGORI GAWA OYOBI OHORA GAWA RYUIKI NI OKERU SHUSUI TOKUSEI NI TSUITE),
For primary bibliographic entry see Field 2E.
W77-05320

A STOCHASTIC APPROACH TO SNOWMELT RUNOFF FORECASTING,
Minnesota Univ., St. Paul; and Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 2C.
W77-05323

RECYCLING AGRICULTURAL RUNOFF,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-05333

VARIATION OF LINK MAGNITUDE WITH MAP SCALE,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 7C.
W77-05338

CRITICAL DURATION OF RAINFALL FOR FLOOD ESTIMATION,
Darling Downs Inst. of Advanced Education, Toowoomba (Australia).
For primary bibliographic entry see Field 2B.
W77-05342

THE ASYMPTOTIC DISTRIBUTION OF THE RANGE AND OTHER FUNCTIONS OF PARTIAL SUMS OF STATIONARY PROCESSES,
Colorado State Univ., Fort Collins.
M. M. Siddiqui.
Water Resources Research, Vol. 12, No. 6, p 1271-1276, December 1976. 20 ref.

Descriptors: *Statistics, *Statistical methods, *Stochastic processes, *Analytical techniques, *Hydrology, Probability, Equations, Mathematical studies, Variability.
Identifiers: *Stationary processes, Partial sums, Functional central limit theorems, Asymptotic distributions.

Many quantities, such as range, first-passage times, and duration of deficit period, are functions of the partial sums of a sequence of random variables. In the reservoir storage problem, the reservoir inputs during each of a set of time periods form a sequence of a random variable. The functional central limit theorem, which has been used to obtain asymptotic results for independent and identically distributed sequences, was shown to apply to a class of stationary sequences as well. To this class belong m-dependent, Markov, autoregressive, and autoregressive-moving average types of stationary processes. (Adams-ISWS)
W77-05347

CHARACTERISTICS OF PROPORTIONAL WEIRS,
Tamil Nadu Agricultural Univ., Coimbatore (India). Dept. of Soil and Water Conservation Engineering.
For primary bibliographic entry see Field 8B.
W77-05355

APPLICATION OF FLOW-SEDIMENT MODEL TO RED RIVER,
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 2J.
W77-05357

PEAK DISCHARGE FREQUENCY FROM RAINFALL INFORMATION,
Colorado Univ. Denver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W77-05359

FLOOD ANALYSIS BY SMEMAX TRANSFORMATION,
For primary bibliographic entry see Field 2E.
W77-05360

CIVIL ENGINEERING CONSIDERATIONS,
Harris (Frederick R.), Inc., Great Neck, N. Y.
For primary bibliographic entry see Field 8A.
W77-05380

SHALLOW SUBSURFACE DRAINAGE-FIELD PERFORMANCE,
Agricultural Research Service, Columbus, Ohio. North Central Region.
N. R. Fausey, and R. D. Brehm.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 6, p 1082-1084, 1088, November-December 1976. 3 fig, 2 tab, 8 ref.

Descriptors: *Subsurface drainage, *Subsurface drains, *Tile drainage, Farm management, Drainage practices, On-site investigations, Drainage systems, Drainage engineering, Tubes, Soil water, Soils, Rainfall, Irrigation, Agricultural engineering.
Identifiers: *Shallow plastic draintubes, Shallow subsurface drainage, Field drainage.

This field study showed that shallow subsurface drains (40 cm deep) remove as much soil water as deeper drains (95 cm deep) during growing season in the Toledo soil. There was no structural damage to the shallow plastic draintubes from farming operations. Thus, shallow drainage systems offer great promise as a drainage technique for a large group of soils for wich subsurface drainage is not now recommended. (Sims-ISWS)
W77-05441

RESERVOIR BASIN MORPHOMETRY,
Victoria-New South Wales Rivers and Water Supply Commission (Australia).
V. S. Michels.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 102, No. IR1, Proceedings Paper 12772, p 13-31, March 1977. 7 fig, 4 tab, 11 ref, 2 append.

Descriptors: *Basins, *Estimating, *Lake morphology, *Reservoirs, Shape, Valleys, Volume, Damsites, Equations, Mathematical models, Topography, Water storage, Depth, Graphical methods, Graphical analysis.
Identifiers: Capacity, Coefficients, Nomographs, Water depth, Surface area, *Morphometry.

The intrinsic morphometry of 20 reservoir basins was studied, using dimensionless graphs to identify and quantify the shape parameters of the following: (1) transverse sections, (2) longitudinal profiles, and (3) width variation with axial length. Two mathematical models of basin morphometry were considered, incorporating (1) a simple power-monomial type, and (2) an exponential type based on several hypotheses regarding basin-shaping agencies. Universal formulas were developed for stored volume in terms of water depth, surface area, and the three parameters. Nomographs were constructed for the power-monomial formula. The capacities of the reservoirs studied were computed by the power-monomial formula, and the results agreed closely with the volumes determined by normal methods. (Visocky-ISWS)
W77-05447

STANDARDS FOR INTERCHANGE OF WATER RESOURCES DATA ON COMPUTER MEDIA,
Australian Water Resources Council, Camberra.
For primary bibliographic entry see Field 7C.
W77-05523

WERRIBEE RIVER BASIN: PROPOSALS FOR WATER RESOURCES MANAGEMENT,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
M. A. Smith.
October 1976. 118 p., 13 tab, 36 fig., 6 append.

Descriptors: *River basin development, *Water management(Applied), *Comprehensive planning, *Australia, Water resources development, Water supply development, Potential water supply, Water demand, Water conservation, Water utilization, Watershed management.
Identifiers: *Werribee R.(Vic).

The Werribee River Basin extends northwest from the shores of Port Phillip Bay in southern Victoria, Australia, about midway between the urban centres of Melbourne and Geelong. This report brings together the available information on the natural characteristics of the area, its water resources, present usage of water resources, and the demands which will be made on those resources by the end of the century. A number of technically feasible methods of safeguarding the existing water supply systems and increasing the water supply available to meet the anticipated demands of increasing urban development are discussed and compared in terms of economics and environmental implications. Consideration is also given to the problems of flood protection, drainage, stream conservation, and wastewater treatment and disposal within the catchment area. (CSIRO)
W77-05524

SEEPAGE FROM SMALL EARTH DAMS,
Western Australia Dept. of Agriculture, South Perth.
For primary bibliographic entry see Field 8D.
W77-05534

4B. Groundwater Management

RADIAL FLOW WITH DISCHARGING-WELL AND OBSERVATION-WELL STORAGE,
Nevada Univ. System, Reno. Water Resources Center; and Nevada Univ., Reno. Desert Research Inst.
P. R. Fenske.
Journal of Hydrology, Vol. 32, No. 1/2, p 87-96, January 1977. 3 fig, 5 ref. ERDA AT(29-2)-1253.

Descriptors: *Groundwater movement, *Wells, *Pumping, *Storage, *Observation wells, Equations, *Theis equation, Well casings, Discharge(Water), Drawdown, Storage coefficient, Graphical methods, Curves, Theoretical analysis, Unsteady flow.
Identifiers: Type curves, Diameter, *Radial flow.

A simple extension of the Theis equation removes the requirement that discharging wells have infinitesimal diameter. Further, in this extension, observation wells also have finite diameters and storage. Type curves for dimensionless drawdown versus dimensionless time can be calculated for the discharging well and all observation wells for conditions of constant discharge or constant drawdown. For an observation well with no storage approaching infinite distance from the discharging well, the type curves become the Theis type curve. For observations at the discharging well with no storage, the type curves become the Hantush type curve. For observations at the discharging well with storage and no observation wells, the type curves become the curves of Papadopulos and Cooper. The effect of observation well storage increases with increasing observation well diameter and number of observation wells. The effect also becomes greater as the discharging well is approached and as the storage coefficient is decreased. (Visocky - ISWS)
W77-05144

NUMERICAL PREDICTIONS OF TWO-DIMENSIONAL TRANSIENT GROUNDWATER FLOW BY THE METHOD OF CHARACTERISTICS,
Michigan State Univ., East Lansing. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-05173

ENVIRONMENTAL TRITIUM AS A HYDROMETEOROLOGIC TOOL IN THE ROSWELL BASIN, NEW MEXICO, I. TRITIUM INPUT FUNCTION AND PRECIPITATION-RECHARGE RELATION,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2F.
W77-05174

ENVIRONMENTAL TRITIUM AS A HYDROMETEOROLOGIC TOOL IN THE ROSWELL BASIN, NEW MEXICO, II. TRITIUM PATTERNS IN GROUNDWATER,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2F.
W77-05175

ENVIRONMENTAL TRITIUM AS A HYDROMETEOROLOGIC TOOL IN THE ROSWELL BASIN, NEW MEXICO, III. HYDROLOGIC PARAMETERS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2F.
W77-05176

A SIMPLE CASE OF CONJUNCTIVE SURFACE-GROUND-WATER MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
Ground Water, Vol. 13, No. 6, p 506-515, November-December 1975. 1 fig, 2 tab, 21 ref, 2 append. OWRT B-076-COLO(5).

Descriptors: *Model studies, *Hydrology, Hydrologic system, Groundwater resources, Groundwater basins, Legislation, *Water management(Applied).

A specific hydrologic model of a stream-alluvial aquifer system was developed for the purpose of designing rules and regulations which maximize the beneficial uses of the waters of a State within the law. The model is particularly suited when decisions on pumping rates are to be reviewed on a frequent regular basis. The procedure is illustrated on a simplified case for which the river loss influence coefficients can be obtained by a combination of analytic derivations and algebraic manipulations. (Skogerboe-Colo St)
W77-05198

CONTROL OF SALT-WATER INTRUSION BY RECHARGE WELLS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W77-05207

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE,
Geological Survey, Menlo Park, Calif.

For primary bibliographic entry see Field 7C.
W77-05263

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 3. SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER,
Geological Survey, Menlo Park. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05264

GROUND-WATER DATA FOR LEFLORE COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05265

GROUND-WATER DATA FOR HUMPHREYS COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05266

GROUND-WATER DATA FOR ISSAQUENA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05267

GROUND-WATER DATA FOR QUITMAN COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05268

GROUND-WATER DATA FOR COAHOMA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05269

GROUND-WATER DATA FOR TATE COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05270

GROUND-WATER DATA FOR TUNICA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05271

GROUNDWATER LEVELS IN NEBRASKA, 1975,
Geological Survey, Lincoln, Nebr. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-05274

GROUND-WATER LEVELS IN OBSERVATION WELLS IN OKLAHOMA, 1971-74,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05275

PROGRESS REPORT ON GEOLOGY OF THE EDWARDS AQUIFER, SAN ANTONIO AREA, TEXAS, AND PRELIMINARY INTERPRETATION OF BOREHOLE GEOPHYSICAL AND LABORATORY DATA ON CARBONATE ROCKS,
Geological Survey, San Antonio, Tex. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-05277

RESPONSE OF GROUND-WATER LEVELS TO FLOOD CONTROL OPERATIONS IN THREE BASINS, SOUTHEASTERN FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
W. A. J. Pitt, Jr.
Open-file report 74-86, 1976. 69 p, 64 fig, 6 tab, 11 ref.

Descriptors: *Groundwater, *Water level fluctuations, *Flood control, *Canals, *Florida, Aquifer characteristics, Groundwater recharge, Groundwater movement, Water control.
Identifiers: Southeastern Florida, Snapper Creek Canal basin, Snake Creek Canal basin, Pompano-Cypress Creek Canal basin.

Three basins in southeastern Florida were investigated to determine the changes in groundwater levels and canal flows that occurred in response to operation of coastal water-control structures in each canal. All three basins are underlain by the Biscayne aquifer. They are, Snapper Creek Canal basin, where the Biscayne aquifer is of high permeability; the Snake Creek Canal basin, where the aquifer is of moderate permeability; and the Pompano-Cypress Canal basin, where the aquifer is of low permeability. In each basin, drainage is a function of permeability; thus, where the permeability of the aquifer is high, drainage is excellent. The coastal water-conrol structures are intended to afford flood protection in the three basins. In general the control operation criteria for flood control in newly developing areas in southeastern Florida do not provide adequate protection from flooding because of the time required for the aquifer to respond to changes in the controls. Adequate protection would require increasing the density of secondary drainage canals, but this could achieved only by reducing the quantity of water available for recharging those segments of the Biscayne aquifer adjacent to the canals. (Woodrad-USGS)
W77-05278

QUALITY-OF-WATER DATA, PALM BEACH COUNTY, FLORIDA 1970-1975,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-05279

GROUND-WATER POLLUTION PROBLEMS IN THE NORTHWESTERN UNITED STATES,
Geraghty and Miller, Inc., Port Washington, N.Y.
For primary bibliographic entry see Field 5B.
W77-05307

STAGE, DISCHARGE AND QUALITY CHANGES IN A WATER TABLE AQUIFER RELATED TO URBANIZATION,
Toledo Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 4C.
W77-05335

THE LYCOMING COUNTY, PENNSYLVANIA, SANITARY LANDFILL: STATE-OF-THE-ART IN GROUND-WATER PROTECTION,
Giddings (Todd) and Associates, State College, Pa.
For primary bibliographic entry see Field 5G.
W77-05363

GROUND-WATER CHEMICAL QUALITY MANAGEMENT BY ARTIFICIAL RECHARGE,
Agricultural Research Service, Fresno, Calif. Western Region.
For primary bibliographic entry see Field 5A.
W77-05364

THE DASHTE-NAZ GROUND-WATER BARRIER AND RECHARGE PROJECT,
Agro-Water Consulting Engineers, Tehran (Iran).
D. E. Williams.
Ground Water, Vol. 15, No. 1, p 23-31, January-February 1977. 10 fig.

Descriptors: *Groundwater recharge, *Irrigation, *Recharge wells, Injection wells, Aquifers, Foreign countries, Saline water intrusion, Artificial recharge, Conductivity, Foreign research, Electrical conductance, Wells, Irrigation wells, Water wells, Groundwater, Connate water, Agriculture, Projects, Groundwater movement, Groundwater barriers, Underground storage.
Identifiers: *Iran, *Dashte-Naz(Iran).

The danger from salination poses a significant threat to development of groundwater resources for domestic or irrigation use in near-coastal environments throughout the world. The Dashte-Naz farm near the Caspian Sea in northern Iran is no exception. Large-scale groundwater development in this region has been limited to wells south of the Caspian Sea near the base of the Alborz mountains where the sediments are coarse and natural recharge high. In the northern regions, however, exploitation of the groundwater resources for agriculture and livestock purposes has proven fruitless, with most of the high-yielding wells turning saline after only several irrigation pumping seasons. The source of the salination comes not from encroachment of Caspian Sea water, but rather from sediments saturated with connate or fossil waters. A wide zone of dispersion separates the salinated aquifers from the freshwater aquifers nearer the mountains. The Dashte-Naz groundwater barrier and recharge project was conceived for purposes of overcoming the problem of exploitation of fresh groundwater reserved in the vicinity of saline water fronts. The project presently under construction is a pilot research project on the practicality of using an injection well barrier for storing water underground in areas immediately adjacent to saline groundwater reservoirs. The results from this project will be used to design other water supply projects in Iran not only along the Caspian Sea coast, but also along the Persian Gulf. (Sims-ISWS)
W77-05365

CONSIDERATION OF TOTAL ENERGY LOSS IN THEORY OF FLOW TO WELLS,
Nevada Univ., Reno, Nev. Desert Research Inst.
For primary bibliographic entry see Field 2F.
W77-05368

CHARACTERIZATION OF SANITARY LANDFILL LEACHATES,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5B.
W77-05432

STANDARDS FOR INTERCHANGE OF WATER RESOURCES DATA ON COMPUTER MEDIA,
Australian Water Resources Council, Camberra.
For primary bibliographic entry see Field 7C.
W77-05523

GRAVITY DRAINAGE OF A SAND PROFILE UNDER A TIME-DEPENDENT SURFACE FLUX,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-05532

4C. Effects On Water Of Man's Non-Water Activities

SOIL MOVEMENT IN ESTABLISHED GULLIES AFTER A SINGLE PRESCRIBED BURN IN THE SOUTH CAROLINA PIEDMONT,
Southeastern Forest Experiment Station, Asheville, N.C.
C. T. Cushwa, M. Hopkins, and B. S. McGinnes.
USDA Forest Service Research Note SE-153, February 1971, p 1-4. 2 fig, 2 ref.

Descriptors: *Soil erosion, Erosion, Burning, *Gullies, *South Carolina, Pine trees, Forest management.
Identifiers: *Prescribed burning, Backfire, Soil movement, Sumter National Forest(SC).

The effect of prescribed burning on soil movement in 25 established gullies was studied on Sumter National Forest, South Carolina. One moderately intense backfire in Piedmont pine communities did not have a measurable effect on soil movement in these gullies. Studies involving the effects of burning on factors other than soil movement are recommended. (Forest Service)
W77-05118

EFFECT OF HIGH INTENSITY STORMS ON SOIL SLIPPAGE ON MOUNTAINOUS WATERSHEDS IN SOUTHERN CALIFORNIA,
Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
For primary bibliographic entry see Field 4D.
W77-05119

USING REPRESENTATIVE WATERSHEDS TO MANAGE FOREST AND RANGE LANDS FOR IMPROVED WATER YIELD,
Forest Service (USDA), Washington, D. C. Div. of Watershed Management.
For primary bibliographic entry see Field 4D.
W77-05120

STREAMFLOW INCREASES AFTER REMOVING WOODLAND-RIPARIAN VEGETATION FROM A SOUTHERN CALIFORNIA WATERSHED,
Arizona Univ., Tucson. Dept. of Watershed Management.
P. B. Rowe.
Journal of Forestry, Vol. 61, No. 5, May 1963. p. 365-370, 7 fig., 14 ref.

Descriptors: *Woodlands, Vegetation, *Streamflow, *Watershed management, *California, Demonstration watersheds, Forest management.

A test of applied watershed management on the San Dimas Experimental Forest in southern California has shown that streamflow yields can be appreciably increased. This was accomplished by clearing the deep-rooted woodland-raparian vegetation from selected canyon bottom reaches of Monroe Canyon, a typical southern California mountain watershed. The increases in flow were especially important because they occurred primarily in summer and in the initial period of soil wetting during succeeding rainy seasons, when streamflow was lowest and water most needed. During the one rainy season of heavy precipitation and continuously wet soils the removal of the woodland-riparian vegetation had no appreciable effect on streamflow, peak discharge, or erosion rates. However, during wetting periods and during the one rainy season of light precipitation, streamflow yields, particularly during storms, were considerably increased. Streamflow was inadequate to produce sediment movement in either the treated or control watersheds during these wetting periods. Removal of the treebrush cover shading the stream course resulted in an increase in the algae content of the late spring and summer flows but had no other detectable effect on waer quality. These first results show that, while streamflow can be increased by removal of the canyon bottom vegetation, this kind of treatment, to be most successful, should be limited to carefully selected areas with conditions of climate, vegetation, soil, and water capable of yielding the desired increases. That is, to areas in which (1) the water supply is adequate to exceed evapo-transpiration losses after treatment, (2) the water table or zone of saturation is within reach of the heavy water using woodland-riparian vegetation, and (3) the canyon bottom soils overlaying the water table are of sufficient extent and depth to permit reduction in evapotranspiration if the deep-rooted vegetation is eliminated. (Forest Service)
W77-05124

CHANGES IN THE QUALITY OF SOIL WATER FOR THREE YEARS FOLLOWING BURNING,
Montana Univ., Missoula. School of Forestry.
N. Stark.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 674. Price codes: A02 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center Research Report No 82, Montana State University, Bozeman, December 1976. 18 p, 1 fig, 2 tab, 18 ref. OWRT A-084-MONT(1).

Descriptors: *Cycling nutrients, *Soil water, Water quality, *Burning, Douglas fir trees, Forest management, *Root zone, Soil chemistry.
Identifiers: Nutrient loss(Trees).

Control burns under Larch/Douglas-fir standing timber were conducted with a wide range of fuel loadings, moisture and climatic conditions. Water quality measured from below the root zone showed little nutrient loss in cool burns with surface temperatures under 200C. Significant nutrient losses did occur in soil water below the root zone of 40% of the burns with surface temperatures in excess of 300C. All accelerated nutrient loss had not ceased below the root zone of hot burns at the end of three years as had been predicted. These data indicate that there is no threat of damage to the long-term productivity of 'biological life' of this soil, but the soil is somewhat chemically fragile for Ca and Mg. (Stuart-Montana State)
W77-05212

ENERGY, AGRICULTURE AND WASTE MANAGEMENT,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
Ann Arbor Science Publishers, Inc. Ann Arbor, Michigan 1975. 540 p. W. J. Jewell, (Editor).

Descriptors: *Energy, *Agriculture, *Waste treatment, *Waste disposal, Food abundance, Feed lots, Engineering.
Identifiers: *Agricultural energy requirements.

Agriculture requires significant energy resources for food and fiber production. New energy demands have also been created in controlling wastes to improve environmental quality. Recently, these two areas have been linked by studies that emphasize the possibility of converting wastes to energy sources. This book discusses in detail three main topics: 1) Energy consumed in food production 2) Technology and energy costs of pollution control, and 3) Potential for producing energy from agricultural wastes. An outstanding feature is the large amount of information compiled on anaerobic fermentation, and the discussion of this technology in producing energy from wastes. To date, few answers have emerged for the engineers, scientists, and policy makers who must recommend directions for the future of food production, energy use and environmental pollution control--these chapters present one of the first attempts to answer these questions. (Skogerboe-Colo St)
W77-05308

STAGE, DISCHARGE AND QUALITY CHANGES IN A WATER TABLE AQUIFER RELATED TO URBANIZATION,
Toledo Univ., Ohio. Dept. of Geology.
B. D. Trexler, Jr, and L. C. Ruedisili.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 539, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, 1976. 72 p, 25 fig, 9 tab, 37 ref, 2 append. OWRT C-3082(No.3682)(5).

Descriptors: *Urbanization, Water quality, Vegetation effects, *Ohio, *Water table aquifers, Water levels, Hydrogeology, Drains, Water pollution sources, Discharge(Water), Water supply, Stage-discharge relations.
Identifiers: Urbanization effects, Water-table responses, *Toledo area(Ohio).

This investigation was divided into two major phases. Phase I was to establish a hydrologic monitoring system and to collect background data on the hydrology and geology of the Oak Openings area. The second phase involved the study of the area as it was developed into a 'new town' containing residential, business, and industrial area. Form the time-dependednt data, a model was to developed of water-table responses in the park. Only preliminary data were gathered from 1972 through 1976 because the urbanization of the 'new town' never materialized. The only urbanization factors affecting the area are the subsurface drains and drainage ditches. Heavy industrial development and large population effects have not developed. The major potential enivronmental problem in the Oak Openings area is the possibility of polluting the water-table aquifer. The aquifer possesses high infiltration and hydraulic conductivity values. Chemicals, oils and domestic sewage spills or discharges would rapidly move to the water table and disperse throughout the aquifer. Such pollution would eliminate the aquifer as a supply of potable water and might drastically disturb the vegetation cover in areas where the water table reaches the root zone.
W77-05335

THE HIGHWAY AS A SOURCE OF WATER POLLUTION: AN APPRAISAL WITH THE HEAVY METAL LEAD,
Lancaster Univ., Bailrigg (England). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W77-05452

4D. Watershed Protection

MULTIPLE USE IN SOUTHERN APPALACHIAN HARDWOODS--A 10-YEAR CASE HISTORY,
Southeastern Forest Experiment Station, Franklin, N.C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 4A.
W77-05112

REVEGETATING COAL MINE SPOILS IN NEW MEXICO: A LABORATORY STUDY,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
For primary bibliographic entry see Field 5G.
W77-05114

HYDROLOGIC MODEL OF A WETLAND FOREST--DETAILS OF CONSTRUCTION,
Southeastern Forest Experiment Station, Asheville, N.C.
C. E. Young, R. A. Klawitter, and J. E. Henderson.

USDA Forest Research Note SE-166, October 1971. 4 p, 2 fig.

Descriptors: *Model studies, Wetlands, Forests, *Hydrologic cycle, *Southeast US.
Identifiers: *Wetland forests.

Details of construction and a bill of materials are presented for a model of the hydrologic cycle on a wetland forest of the southeastern coastal plain. (Forest Service)
W77-05115

ANALYSIS OF REHABILITATION TREATMENT ALTERNATIVES FOR SEDIMENT CONTROL,
Pacific Southwest Forest and Range Experiment Station, Berkley, Calif.
E. L. Nobel, and L. J. Lundeen.
In: Proceedings of a Symposium Forest Land Uses and Stream Environment, October 19-21, 1970, p 86-96. 6 tab, 4 fig, 6 ref.

Descriptors: *Sediment control, Fisheries, Rivers, *Sedimentation, Land management, Soils, Hydrology, Water pollution control, *Idaho.
Identifiers: *South Fork Salmon River(Ida).

The aquatic environment of the South Fork Salmon River has been severely damaged in recent years by excessive rates of sediment production. A special study was conducted to determine the source and extent of the damage, and measures required to reduce future sediment production to a 'tolerable' level. Linear programming was used as an aid to select from 190 possible treatment alternatives and minimize treatment costs at various levels of sediment reduction. The desired level of sediment could be reached at a cost of $5 million. Debris basis to trap sediment moving in the channel were the most effective and economical type of treatment while control of sediment production from roads and timber harvest on steep, fragile lands would have a very high cost. (Forest Service)
W77-05116

SOIL MOVEMENT IN ESTABLISHED GULLIES AFTER A SINGLE PRESCRIBED BURN IN THE SOUTH CAROLINA PIEDMONT,
Southeastern Forest Experiment Station, Asheville, N.C.
For primary bibliographic entry see Field 4C.
W77-05118

EFFECT OF HIGH INTENSITY STORMS ON SOIL SLIPPAGE ON MOUNTAINOUS WATERSHEDS IN SOUTHERN CALIFORNIA,
Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
R. M. Rice, and G. T. Foggin, III.
Water Resources Research, Vol 7, No 6, December 1971. p 1485-1496. 4 fig, 5 tab, 12 ref.

Descriptors: *Soil erosion, Debris, *Brush control, *California, Storms, Watershed management, Grasslands.
Identifiers: *Soil slippage, Mountain watersheds.

The conversion of brush areas to grassland increased soil slip erosion on mountainous watersheds in southern California during the intense winter storms of 1969. The incidence of soil slippage, site factors affecting slope stability, and amount of debris generated by slippage were investigated for sample brush and grass areas in the San Dimas Experimental Forest. Soil slippage occurred on 5.5% of the brush areas and 16.7% of the grass areas, the values for both areas being about twice those measured in 1966 for a less intense storm period. The effectiveness of linear discriminant analysis was below that of 1966. In all probability, the thresholds of several environmental factors are not linear, and the 1969 storms crossed the thresholds of several factors responsible for more widespread slippage. (Forest Service)
W77-05119

USING REPRESENTATIVE WATERSHEDS TO MANAGE FOREST AND RANGE LANDS FOR IMPROVED WATER YIELD,
Forest Service (USDA), Washington, D. C. Div. of Watershed Management.
E. J. Dortignac, and B. Beattie.
Publication No. 66 of the I.A.S.H. Symposium of Budapest, p. 480-488, 1965. 1 fig., 5 ref.

Descriptors: *Water yield improvement, *Forest management, Soil analysis, Vegetation, Climates, *Land management, *Watershed management.

The knowledge gained from experimental watersheds of the Forest Service and the data accumulated on other representative watersheds establishes a broad base for scientific management of forest and range lands. These findings make it possible to predict hydrologic behavior on selected watersheds for given climatic events, provided the watershed is intensively inventoried and appraised. A reasonably accurate prediction of results is essential to management decisions on whether or not to expend the energy and funds needed to implement a watershed prescription. The Forest Service uses a system of 'Representative Watersheds,'50-159 thousand acres in size to bridge the gap between research findings and operational management of drainage basins for improving the timing, quantity, and quality of water yield from the National Forests. These watersheds register the changes in water yield occasioned by a wide variety of activities in the watershed. From this, the name 'Barometer Watersheds' was derived. Described are the selection of representative areas; the techniques for analysis and evaluation of soil, vegetation, climate, and hydrologic behavior; and, the use of barometer watersheds for the application of hydrologic principles and research findings to meet specific watershed management objectives. Also, the present status of a mathematical system for evaluating alternative watershed prescriptions as an aid in management decisions is discussed. (Forest Service)
W77-05120

SOIL WATER AVAILABILITY IN AN ARIZONA MIXED CONIFER CLEARCUTTING,
Rocky Mountain Forest and Range Experiment Station, Flagstaff, Ariz.
R. S. Embry.
USDA Forest Service Research Note RM-206, 1971, p. 1 - 4, 2 fig., 1 tab., 7 ref.

Descriptors: *Soil moisture, *Soil water, *Mixed forest, *Wilting, Clearcutting, *Arizona, Soil-water-plant relationships.

Only under grass on level and southerly exposures did soil moisture deficits approach or exceed the permanent wilting point. Under burned and scalped surfaces, adequate moisture was available for the survival of established seedlings and planted stock throughout the growing season on all exposures. (Forest Service)
W77-05121

STREAMFLOW INCREASES AFTER REMOVING WOODLAND-RIPARIAN VEGETATION FROM A SOUTHERN CALIFORNIA WATERSHED,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4C.
W77-05124

A NONLINEAR KINEMATIC WAVE MODEL FOR WATERSHED SURFACE RUNOFF,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W77-05140

SUSTAINED FLOW IN SMALL APPALACHIAN WATERSHEDS UNDERLAIN BY CARBONATE ROCKS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2F.
W77-05143

A DISTRIBUTED CONVERGING OVERLAND FLOW MODEL 3. APPLICATION TO NATURAL WATERSHEDS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W77-05168

LOW-FLOW CHARACTERISTICS OF STREAMS ON THE KITSAP PENINSULA AND SELECTED ADJACENT ISLANDS, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-05273

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, JOHN DAY DRAINAGE BASIN.
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W77-05285

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, DESCHUTES DRAINAGE BASIN.
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W77-05286

SPECIAL WATERSHED PROJECTS.
SEDA Council of Governments, Lewisburg, Pa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 440, Price codes: A05 in paper copy, A01 in microfiche. Prepared for the U.S. Department of Housing and Urban Development and the Appalachian Regional Commission, August 1975. Report 75-15, 88 p, 11 tab, 9 fig.

Descriptors: *Watershed management, Rainfall-runoff relationships, *Water conservation, *Runoff forecasting, *Pennsylvania, Storm runoff, Hydrologic data, Zoning, Land use, Urban runoff, Slopes, Flood plains, Land management, Land reclamation, Runoff coefficients, Revegetation, Strip mines, Fish conservation.
Identifiers: *Pine Run Watershed(PA), *Shamokin Creek Watershed(PA), Lycoming County(PA), Northumberland County(PA), Flood plain management.

The Pine Run watershed in Lycoming County, PA, and the Shamokin Creek watershed in Northumberland County, PA, are studied. The development impact of steep and poorly drained land on stormwater runoff is studied at Pine Run. Runoff data which relate volume to land use, slope and soil type were collected. Runoff volumes, assuming variable land uses, were calculated. The calculations aided the selection of a desirable development pattern, to be implemented via zoning ordinances. The first Shamokin study was a demonstration project to find ways of reducing flooding and rapid runoff using conservation techniques and materials that are widely available and can be applied at a level of expertise existing in County planning agencies or watershed organizations. The research method involved: (1) description of general watershed characteristics; (2) land use

problem identification survey; (3) examination of soil and water conservation plans, recent soil surveys, and other sources to identify existing conservation practices in the area: (4) estimation of land treatment conservation needs; (5) analysis of this information to determine courses of action. Corrective action recommendations focused on flood plain management, acid mine drainage, revegetation, land reclamation, debris basins, small levees, dry dams, and trout stream preservation. A special hydrologic study of the upper Shamokin concluded that the relatively low peak discharges and runoff coefficients resulted from the many closed basins, exposed granular material from strip mining, and shafts into underground mines. (Nessa - NC)
W77-05292

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS. HOOD DRAINAGE BASIN,
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W77-05298

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, WILLAMETTE DRAINAGE BASIN,
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W77-05299

CONTRIBUTION OF SUBSURFACE FLOW FROM THE UPPER SLOPES OF FORESTED WATERSHEDS TO CHANNEL FLOW,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
For primary bibliographic entry see Field 2G.
W77-05436

CALCULATING EVAPORATION FROM NATIVE GRASSLAND WATERSHEDS,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 2D.
W77-05442

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

THE USE OF BLUE-GREEN ALGAL VIRUSES AS INDICATORS OF THE EFFICIENCY OF WATER TREATMENT IN ELIMINATION OF HUMAN ENTERIC VIRUSES,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5F.
W77-05107

ERRORS IN ATOMIC ABSORPTION ANALYSIS FOR METALS IN SURFACTANT SOLUTIONS,
Missouri Univ., Rolla. Dept. of Chemistry.
R. L. Venable.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 184, Price codes: A02 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, September 30, 1976. 17 p, 6 fig, 4 ref. OWRT A-090-MO(1). 14-34-0001-6026.

Descriptors: Aqueous solutions, Metals, *Detergents, *Surfactants, *Copper, *Pollutant identification, *Instrumentation, Bromides, Analytical techniques, *Spectrophotometry.
Identifiers: Cationic surfactants(Bromides), *Atomic absorption spectrophotometry.

Aqueous solutions in the pH range 2 to 4.5 containing 3 ug/ml of copper with varying concentrations of the anionic surfactant sodium dodecyl sulfate (SDS) were analyzed for copper. At pH 2 tghe cationic surfactants dodecyl pyridinium bromide (DPB) and tetradecylpyridinium bromide (TPB) were also used. Enhancement of instrument response was observed with SDS at pH values of 2, 3 and 3.4, but a depression of instrument response was observed at pH 4.5. Much less signal enhancement was observed at pH 2 with DPB than with SDS and no significant enhancement was observed with TPB at this pH. The same type of enhancement of instrument response is observed for magnesium and cadmium, and has already been reported for nickel at pH 2 with SDS as the surfactant. Thus, the signal enhancement seems to be rather general for divalent metals at low pH with this particular surfactant which is quite similar to the surfactant in many commercial detergents. Viscosity and density changes observed for such solutions are far too small to cause the effects observed. Surface tension does not appear to be a major factor in producing the enhancement or depression of signal. It is doubtful if such errors would be significant in routine analyses unless the samples were at rather low pH.
W77-05110

AEROSOL IN THE GATE AREA AND ITS RADIATIVE PROPERTIES,
Leningrad State Univ. (USSR). Dept. of Atmospheric Physics.
For primary bibliographic entry see Field 2K.
W77-05131

ATMOSPHERIC DISPERSION CHARACTERISTICS IN THE LOUISIANA COASTAL ZONE,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
S. A. Hsu.
Sea Grant Publication No. LSU-T-76-011(t), November 1976. 30 p, 14 fig, 30 ref.

Descriptors: *Louisiana, Water pollution sources, Pollutants, Land breezes, Sea breezes, *Dispersion, Gulf of Mexico, *Path of pollutants, Coasts, Pollutant identification.
Identifiers: Coastal zone, *Atmospheric dispersion, Nearshore pollution, Atmospheric motion, Internal boundary layer, Coastal zone management.

Atmospheric dispersion characteristics in the coastal zone are unique in that physical processes of air, sea, and land combine at the shoreline to create motions on many scales which differ in important respects from processes over land or over water. Some of these differences in coastal Louisiana are reviewed. Synoptic-scale characteristics indicate that the coastal zone is superior to areas farther inland for dispersing pollutants. However, mesoscale and microscale studies reveal that diurnal circulation of land-breeze and sea-breeze systems and the development of an internal boundary layer because of aerodynamic roughness changes across the shoreline may actually increase pollution concentration in the nearshore region. Specific studies on these scales of atmospheric motion in relation to the optimum siting for industrial plants are outlined and recommended. (NOAA)
W77-05132

BORON IN COASTAL NORTH FLORIDA RAINFALL,
North Carolina Univ. at Chapel Hill. Marine Sciences Program; and North Carolina Univ. at Chapel Hill. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W77-05152

REMARKS ON THE SHORT TERM VARIABILITY OF THE PARAMETERS RELATING TO THE NUTRIENT AND OXYGEN BALANCE DURING THE SYNOPTIC INVESTIGATION OF SHALLOW INLETS DURING 1972, (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Marine and Fishery Biology.
G. Schlungbaum, D. Ventz, U. Schultze, and S. Stolle.
Wiss Z Univ Rostock Math-Naturwiss Reihe 22(10), p 1085-1094, 1973.

Descriptors: *Variability, *Nutrients, *Oxygen, Phosphorus, Phosphates, Nitrogen, Coasts, Inlets(Waterways), Climates, Measurement.
Identifiers: *East Germany, Orthophosphates.

Comprehensive measurements of the variability of nutrient and O2 balance were taken at 4 stations. The following parameters were investigated: total P, dissolved o-phosphate, organic phosphate, total N, NH4-N, NO2-N, NO3-N, total inorganic N, orgaic N and O2 saturation index. Selected examples are used to discuss the dependence of the data on the hydrographic and meterological situations and on time. The complexity of the composition and variability of the parameters in coastal waters (East Germany) for the material balance are described.--Copyright 1976, Biological Abstracts, Inc.
W77-05159

NITROGEN CONTENT AND ACIDITY OF RAIN ON THE GEORGIA COAST,
Georgia Univ., Sapelo Island. Marine Inst.
E. B. Haines.
Water Resources Bulletin, Vol. 12, No. 6, p 1223-1231, December 1976. 3 fig, 1 tab, 17 ref. NSF DES-75-20842.

Descriptors: *Chemistry of precipitation, *Nitrogen, *Acidity, *Rainfall, *Georgia, Hydrogen ion concentration, Nitrates, Nitrites, Acids, Water chemistry, Precipitation(Atmospheric), Chemical analysis, Sampling, Analytical techniques, Meteorology, Chemistry, Pollutant identification.
Identifiers: *Rainwater nitrogen content, *Acid precipitation.

Since nitrogen is a nutrient frequently in short supply in coastal ecosystems, an estimate of the nitrogen input via rain was made for the Georgia coast. Water samples collected in 34 separate storms during a 12 month period were analyzed for concentrations of ammonia, nitrate plus nitrite, and dissolved organic nitrogen (DON). The range and average concentration in micromoles of nitrogen per liter were 0.0 to 137 (6.3) for ammonia, 1.0 to 21 (7.9) for nitrate plus nitrite, and 0.0 to 13.6 (4.0) for DON. DON, not usually measured in rain, comprised up to 62% of the total nitrogen content. The annual amount of nitrogen contributed by rain to the coast was about 0.3 g N/sq m. This value is a small fraction of the calculated nitrogen requirements of coastal plants. More than half the rain samples had pH values less than the CO2 equilibrium pH of 5.6. Values as low as 4.2 were in the range of pH values reported for acid rain in Europe and the northeastern U.S. Total titratable acidity was measured for 12 summer rainwater samples. The results for 7 individual storms showed a highly linear relation between hydrogen ion concentration and total acidity. However, the slope of the regression line indicated that increases in acidity were not a result of addition of strong acid alone. (Sims-ISWS)
W77-05163

MEASUREMENT AND FORMS OF NITROGEN AND PHOSPHOROUS,
Federal Water Quality Administration, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
E. F. Barth.

Nitrogen Removal from Wastewater, Advanced Waste Treatment Seminar, Session I, October 28-29, 1970, San Francisco, California. May, 1970, p 1-16. 4 fig, 6 tab, 2 ref. FWQA 17010--05/70.

Descriptors: *Waste water treatment, *Pollutant identification, *Analytical techniques, *Measurement, Nitrogen, Nitrates, Nitrites, Phosphorus, Phosphorus compounds.

Nitrogen and phosphorus chemistry is discussed from a treatment standpoint. Nitrogen and phosphorus are in the same chemical family. Although their chemical reactions are similar, the resulting compounds vary significantly. A total phosphorus assay should be used to judge actual operating efficiency. This approach is necessary because many forms of phosphorus are found in waste waters and sludges. The most logical way to report results of phosphorus analyses is as elemental phosphorus. Nitrogen also occurs in waste waters in many forms, but the analytical procedures for nitrogen are specific for each form. The whole nitrogen series must be determined to get reliable data. Since the actual toxicant is nitrite, the Drinking Water Standards should be based on nitrite plus nitrate rather than only on nitrate nitrogen. Operators of automated analytical instruments should be sufficiently well informed to understand the limitations of the instruments. (See also W72-04085) (Snyder-FIRL)
W77-05169

FATE 2,4,5-T CONTAMINANT, 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD) IN AQUATIC ENVIRONMENTS,
Wisconsin Univ., Madison. Dept. of Entomology.
F. Matsumura.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 187, Price codes: A04 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, WIS WRC 77-01, 1977. 22 p, 3 fig, 8 tab, 9 ref. OWRT A-058-WIS(1), 14-31-000-4050. 14-31-000-5050.

Descriptors: *Pesticide residues, *Pollutant identification, Pollutants, Water pollution sources, *Plant growth regulators, Analytical techniques, *Chromatography, *Lake sediments, Lakes, *Herbicides, Organic compounds, Organic acids, *Path of pollutants.
Identifiers: *Lake water.

There has been recent concern about the use of the herbicide 2,4,5-T (2,4,5-Trichloro-phenoxyacetic acid) because of the presence of small amounts of its contaminant, TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin). TCDD is an extremely toxic compound and is also teratogenic at very low levels (microgram/kilogram). It is about a thousand times more toxic to rats than parathion and 100,000 times more toxic than DDT. This study describes the fate of TCDD in lake water and sediment by studying its microbial degradation, evaporation and adsorption to sediment. Under the experimental conditions described in the study, the following conclusions can be drawn: (1) TCDD is mostly bound with the lake sediment where it is stable and not very available for microbial degradation; (2) the binding of TCDD to unknown factors makes it difficult to recognize metabolic products; (3) the metabolism of TCDD that occurs in the aqueous phase is genuine, as judged by the freeze-drying technique, although the extent of metabolism is very small; (4) the metabolites are degraded faster than TCDD since metabolite production decreased with time, indicating an apparent case of intermediary metabolism; there is an optimum time for TCDD degradation (probably about one month) where the available TCDD is degraded, leaving the non-available TCDD in the sediment; (5) the conditions that favored the very limited degradation of TCDD were the presence of sediment, microbial activities and/or organic matter in the aqueous phase; (6) water-mediated evaporation of TCDD apparently occurred. (Diamantis-Wisconsin)
W77-05170

EVALUATION OF METALS IN WASTEWATER SLUDGE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
R. C. Stover, L. E. Sommers, and D. J. Silviera.
Journal Water Pollution Control Federation, Vol. 48, No. 9, p 2165-2175, September, 1976. 9 tab, 17 ref. OWRT B-066-IND(1).

Descriptors: *Municipal wastes, *Sludge, *Heavy metals, Chemical properties, Physical properties, *Lead, *Copper, *Zinc, *Cadmium, *Nickel, Soils, Soil amendments, Sorption, Separation techniques, Plant growth, Ion exchange, Chemical precipitation, Chelation, Chemical reactions.
Identifiers: Extraction procedures.

Sequential extractions of lead, copper, zinc, cadmium, and nickel from 12 samples of sludges obtained from municipal waste water treatment plants revealed that sludges contain a wide variety of sites capable of metal retention. Retention mechanisms include ion exchange, sorption, chelation, and precipitation. Metal retention appeared to be highly variable, depending on the chemical properties of the sludge and on the nature of the metal in question. Because the predominant forms of the above metals are not the same in each sludge, it is expected that each metal will respond differently after incorporation into soil systems. Even though the exact forms of metals in sludge are not apparent, sequential extraction results obtained for sorbed and exchangeable fractions of the metals may indicate which metals can be most readily used by plants growing in soils treated with waste water sludge. (Kreager-FIRL)
W77-05197

DETERMINATION OF TOTAL MERCURY IN SOILS AND SEDIMENTS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
M. Floyd, and L. E. Sommers.
Journal of Environmental Quality, Vol. 4, No. 3, 1975. p 323-325, 3 tab, 9 ref. OWRT A-023-IND(2).

Descriptors: *Mercury, Soils, *Sediments, Pollution, Soil tests, *Soil chemistry, *Soil analysis, *Pollutant identification.
Identifiers: *Atomic absorption analysis.

A simple one-step digestion prodcedure was evaluated for extracting total mercury from soils and sediments. The procedure evaluated involves digesting soil or sediment samples with concentrated HNO3 and 4N K2Cr207 (2:1, vol/vol) for 4 hours at 55C and analyzing mercury in the extract by flameless atomic absorption. Recovery of total mercury from diverse samples was comparable to or exceeded that obtained by four alternative total mercury procedures. Essentially quantitative recovery of mercury was obtained when samples were amended with mercuric chloride, methylmercuric chloride, phenylmercuric acetate, and mercuric sulfide. The procedure developed was precise with coefficients of variation ranging from 1 to 3%. Parameters affecting the quantitative extraction of total mercury were studied. (Skogerboe-Colo St)
W77-05201

A WATER QUALITY DATA REPORT OF THE COORDINATED MONITORING PROGRAM. METHODS AND DATA FOR 1974.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 2L.
W77-05208

AQUATIC ALGAE AS A DIFFUSE SOURCE OF BACTERIAL CONTAMINATION IN NATURAL WATERS,
Montana State Univ., Bozeman. Dept. of Microbiology.
Gordon A. McFeters, Sidney A. Stuart, Anne K. Camper, and Susan B. Olson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 384, Price codes: A02 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Research Report No. 83, December 1976. 13 p, 4 fig, 17 ref. OWRT A-092-MONT(1). 14-34-0001-6027.

Descriptors: *Aquatic algae, *Bacteria, *Water quality, Natural streams, Indicators, *Bioindicators, *Chlorella, Coliforms, *Pollutant identification.

Surprisingly high numbers of indicator bacteria were consistently found in a pristine alpine stream during mid and late summer months. This occurrence coincided with the development of an algal community on the rocks within this stream. Studies using the predominant alga from this community (Chlorella) and various coliforms suggest that these indicator bacteria may proliferate in the stream by using extracellular algal products. This finding suggests a situation where fecal contamination might falsely be assumed to exist irrespective of humans or animals near the stream. (Stuart-Montana State)
W77-05211

THE USE OF OXYGEN DEFICIT MEASUREMENTS AS AN INDEX OF EUTROPHICATION IN TEMPERATE DIMICTIC LAKES,
For primary bibliographic entry see Field 5C.
W77-05222

ALLOWANCE FOR THE VARIABILITY OF DISCHARGES IN COMPUTATIONS OF THE DILUTION OF WASTE WATERS IN RIVERS,
For primary bibliographic entry see Field 5B.
W77-05234

USING LINEAR PROGRAMMING TO DESIGN OIL POLLUTION DETECTION SCHEDULES,
Naval Underwater Systems Center, Newport, R. I.
For primary bibliographic entry see Field 5G.
W77-05250

MAJOR CARBON 14 ANOMALY IN A REGIONAL CARBONATE AQUIFER: POSSIBLE EVIDENCE FOR MEGASCALE CHANNELING, SOUTH CENTRAL GREAT BASIN,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-05261

GUIDELINES FOR COLLECTION AND FIELD ANALYSIS OF GROUND-WATER SAMPLES FOR SELECTED UNSTABLE CONSTITUENTS,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-05262

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W77-05263

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 3. SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER,
Geological Survey, Menlo Park. Water Resources Div.

For primary bibliographic entry see Field 7C.
W77-05264

GROUND-WATER DATA FOR LEFLORE COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05265

GROUND-WATER DATA FOR HUMPHREYS COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05266

GROUND-WATER DATA FOR ISSAQUENA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05267

GROUND-WATER DATA FOR QUITMAN COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05268

GROUND-WATER DATA FOR COAHOMA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05269

GROUND-WATER DATA FOR TATE COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05270

GROUND-WATER DATA FOR TUNICA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05271

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE INNER COASTAL PLAIN OF SOUTH CAROLINA,
Geological Survey, Columbia, S.C. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-05272

QUALITY-OF-WATER DATA, PALM BEACH COUNTY, FLORIDA 1970-1975,
Geological Survey, Tallahassee, Fla. Water Resources Div.
W. L. Miller, and A. C. Lietz.
Open-file report 76-784, 1976. 100 p, 3 fig, 12 tab, 1 ref.

Descriptors: *Water quality, *Water pollution sources, *Chemical analysis, *Surface waters, *Groundwater, *Florida, Sampling, Chemical properties, Physical properties, Water analysis.
Identifiers: Palm Beach County(Fla).

One of the most pressing problems of Palm Beach County, Florida, is the present and potential contamination of the surface and ground-water resources. The canals which dissect the urban and agricultural areas are convenient receptacles for storm-water runoff, sewage effluent, and agricultural wastes. Contaminants in the canals may enter the shallow aquifer as the canal water infiltrates. The quality of water in the shallow aquifer is further influenced by constituents in infiltrating rainwater, septic tank effluent, and many other sources of contamination. The County Health Department has stated that many of the canals and lakes, including Lake Worth, an estuary, have reached levels of contamination rendering them unfit for recreation (Land and others, 1972). The purpose of this report is to: (1) Compile the basic water-quality data collected during 1970-75 as a part of the monitoring program. (2) Make these data available in a usable form to assist in urban and regional planning of the county's water resources. The water-quality programs include 36 surface-water stations on canals and lakes and 136 ground-water stations which have been regularly sampled. Both urban and agricultural areas are included in the sampling programs. (Woodard-USGS)
W77-05279

LAKES OF OREGON: VOLUME 4. CLACKAMAS COUNTY,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 2H.
W77-05283

GROUND-WATER POLLUTION PROBLEMS IN THE NORTHWESTERN UNITED STATES,
Geraghty and Miller, Inc., Port Washington, N.Y.
For primary bibliographic entry see Field 5B.
W77-05307

THE CHARACTERIZATION OF PHOSPHORUS EXCRETION PRODUCTS OF A NATURAL POPULATION OF LIMNETIC ZOOPLANKTON,
New Hampshire Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-05313

ALGAL COMPETITION IN AN EPILITHIC RIVER FLORA,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W77-05314

DEVELOPMENT OF MATHEMATICAL MODELS FOR THE WATER QUALITY MANAGEMENT OF THE PEARL RIVER, JACKSON, MISSISSIPPI,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 5D.
W77-05327

ENGINEERING, SANITARY AND MUNICIPAL MODELING, IDENTIFICATION AND CONTROL OF A DYNAMIC AND STOCHASTIC CHEMICAL BIOLOGICAL PROCESS,
Wisconsin Univ.-Madison.
For primary bibliographic entry see Field 5D.
W77-05330

ACTIVATED CARBON ADSORPTION IN MUNICIPAL WASTE WATER TREATMENT AND REUSE SYSTEMS,
Washington Univ., Seattle.
For primary bibliographic entry see Field 5D.
W77-05332

GROUND-WATER CHEMICAL QUALITY MANAGEMENT BY ARTIFICIAL RECHARGE,
Agricultural Research Service, Fresno, Calif. Western Region.
H. I. Nightingale, and W. C. Bianchi.
Ground Water, Vol. 15, No. 1, p 15-21, January-February 1977. 6 fig, 5 tab, 17 ref.

Descriptors: *Groundwater recharge, *Artificial recharge, *Water quality, *California, Monitoring, Recharge ponds, Pit recharge, Groundwater, Groundwater movement, Chemicals, Nitrates, Salinity, Salts, Conductivity, Specific conductivity, Wells, Water wells, Sampling.
Identifiers: *Fresno(Calif), *Leaky Acres Recharge Facility(Calif).

The effectiveness of basin groundwater recharge at the Leaky Acres Recharge Facility in Fresno, California, for improving the regional groundwater quality was studied as 65,815,000 cu m of high quality surface water was recharged from 1971 through 1975. Observation wells at the facility showed some variability in chemical parameters associated with each recharge period. The long-term decreased in salinity could be described by a power law decay curve fitted by regression analysis. Without a special network of observations wells outside the facility, scientific evaluation of the enclave of recharged water is not possible. A practical evaluation of water quality changes is possible from producing water wells around the facility. However, the pumping well discharge time variations, well depth, aquifer sequence, and prior use of surrounding land must be considered, since all of these factors affect the pumped-water quality and its seasonal variability. Recharge at Leaky Acres had noticeably decreased the groundwater salnity for a distance of up to 1.6 km in the direction of the regional groundwater movement. (Sims-ISWS)
W77-05364

FIELD DETECTION AND DAMAGE ASSESSMENT MANUAL FOR OIL AND HAZARDOUS MATERIAL SPILLS.
Environmental Protection Agency, Washington, D.C. Div. of Oil and Hazardous Materials.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 789, Price codes: A11 in paper copy, A01 in microfiche. June 1972. 457 p. 68-01-0113.

Descriptors: *Oil spills, *Oil pollution, *Water pollution, Resources development, *Pollutant identification, *Coasts, Hazards.
Identifiers: *Outer Continental Shelf, *Hazardous materials, Manuals, Environmental protection, Field handbooks.

This manual is primarily for use by Federal and State officials with on-site responsibility for field investigation of damage after a spill of oil or hazardous polluting substances. It is directed to all members of the damage assessment team, and especially to the team leader. Damage assessment, with the notable exception of fish kills, has not previously been treated as a systematic subject. Federal and other standard reference works, such as those quoted here, provide for the training and guidance of field investigators of water pollution, but there is nothing about sudden unpredictable spills, except in detailed reports of individual incidents. The manual consists of seven chapters which deal with methods and procedures, and an appendix which is a compendium of data on hazardous materials. The chapters are: Survey - Step-by-step instructions on what to do, from time of arrival until a full damage assessment plan is in operation; Chemical and physical equipment and techniques for detection and identification; Sampling, Biological damage assessment: Equipment and techniques; Damage assessment procedures - a systematic approach to the application of field investigations to damage assessment; Statistics - comment and guidelines on the use of statistics in the field, and the requirements for a damage assessment report; and Reporting and Legal requirements - a checklist of rules for meeting legal requirements, and of details to be included in a damage report. (Sinha-OEIS)
W77-05374

AQUEOUS SOLUBILITIES OF WEATHERED NORTHERN CRUDE OILS,
Toronto Univ. (Ontario). Dept. of Chemical Engineering and Applied Chemistry; and Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
D. Mackay, and W. Y. Shiu.
Bulletin of Environmental Contamination, Vol 15, No 1, p 101-109, 1976. 3 fig, 3 tab, 9 ref.

Descriptors: *Oil spills, *Aquatic life, *Weathering, *Pollutant identification, Water pollution, *Resources development, *Baseline studies, *Environmental effects, Toxicity, Diffusion.
Identifiers: *Outer Continental Shelf, Aromatic hydrocarbons, Crude oils, Benzene, Toluene.

It is suggested that gas stripping is the best method of determining the aqueous solubility of the lighter components of crude oils. These components, especially benzene and toluene, constitute the bulk of the dissolved material. As weathering or evaporation proceeds the solubility falls considerably as the more volatile and soluble compounds are lost. An approximate estimate of the total and component solubilities of crude oil in water can be made from the oil analysis alone. The environmental implications are that aquatic biota may be exposed to relatively high concentrations of dissolved aromatic hydrocarbons in the first few hours after a crude oil spill but as the oil weathers, it solubility, and presumably the toxic effects, are reduced. A knowledge of the response of biota to concentration of dissolved hydrocarbons, particularly aromatics, when coupled to an estimate of the solubility of a weathering oil and an estimate of the rate of diffusion of dissolved hydrocarbons from the oil slick could lead to a more quantitative estimate of the toxic effects of crude oil spill on water. Only when the three factors; solubility as a function of weathering; diffusion rates; and specific toxicity can be quantified and combined can the full environmental impact of oil spills be assessed. (Sinha-OEIS)
W77-05376

MARINE POLLUTION RESEARCH TITLES.
Marine Biological Association of the United Kingdom, Plymouth (England). Marine Pollution Information Centre.
Marine Pollution Research Titles, Vol 3, No 3, March 1976. 28 p.

Descriptors: *Bibliographies, *Pollutant identification, *Oil pollution, Thermal pollution, *Water pollution sources, *Water pollution effects, Monitoring, Pesticides, Metals, Radioactivity, Domestic waste, Pulp and paper industry, Food processing industry, Solid wastes, Polychlorinated biphenyls.
Identifiers: *Outer Continental Shelf, *Estuarine pollution, *Marine pollution.

This current awareness publication includes 205 selected references of the approximately 2,000 papers on marine and estuarine pollution published each year. It is divided into the following sections: General - general discussions on marine and estuarine pollution, or papers where several pollutants are disussed; Detection - includes remote sensing, pollution indicators, and monitoring systems. Detection of a specific pollutant is included under that pollutant; Analysis - includes mathematical models, experimental methods and equipment, and general chemical analysis. Analysis of a specific pollutant is included under that pollutant; Oil - includes detection, analysis, levels in the marine environment, effects, oil characteristics, etc.; Oil removal - includes dispersants, physical removal, burning, sinking, absorption, gelling, biodegradation, etc,; Metals; Pesticides; Radioactivity; Polychlorinated biphenyls; Other chemicals; Domestic sewage; Pulp and paper; Food processing; Heat; and Solids. (Sinha-OEIS)
W77-05383

SAMPLING VARIATION IN SANDY BEACH LITTORAL AND NEARSHORE MEIOFAUNA AND MACROFAUNA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 2L.
W77-05388

THE WEISS SATUROMETER; MAGIC BOX SOLVES GAS MEASUREMENT PUZZLE,
Agency, Seattle, Wash.
EPA Newsletter No. 2, July 1972, p. 4-7, 3 fig.

Descriptors: *Supersaturation, *Nitrogen, Dissolved oxygen, *Methodology, *Monitoring, On-site investigation, On-site data collection, *Analytical technique, Water quality, Atmospheric gases, Laboratory equipment, *Pollutant identification.
Identifiers: *Weiss saturometer, Total dissolved gas pressures.

The Weiss saturometer measures total dissolved gas pressure in water. Anyone with minimal training can place the unit in water and have a reading in 12 minutes. The saturometer is small, compact, and durable for field work. (Katz).
W77-05418

DEUTERIUM, TRITIUM AND GROSS-BETA-ACTIVITY INVESTIGATIONS ON ALPINE GLACIERS (OTZTAL ALPS),
Innsbruck Univ. (Austria). Physikalisches Institut.
For primary bibliographic entry see Field 2C.
W77-05420

EFFECT OF SURFACTANTS ON THE DETERMINATION OF FLUORIDE IN WATERS,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
P. Pakalns, and Y. J. Farrar.
Water Research, Vol. 10, No. 12, p 1087-1092, 1976. 1 fig, 3 tab, 8 ref.

Descriptors: *Pollutant identification, *Fluorides, *Surfactants, *Detergents, *Chemical analysis, *Analytical techniques, Fluorine, Water treatment, Soaps, Water pollution sources, Nitrilotriacetic acid, Linear alkylate sulfonates, Cleaning, Domestic wastes, Foaming, Electrodes, Water quality, Halides.
Identifiers: Specific ion electrode, Spectrophotometric method, Sodium tripolyphosphate, Fluoride electrode.

Eleven surfactants representing pure cationic, anionic, and nonionic detergents; four commercial detergents; sodium pyrophosphate; sodium tripolyphosphate; a soap; and nitrilotriacetic acid were investigated for their effect on the spectrophotometric and specific ion electrode determinations of fluoride in water. Cationic, anionic, and nonionic detergents at concentrations up to 50, 400, and 1000 mg/l, respectively, gave 5% error or less in the determination of fluoride. Sodium tripolyyphosphate interfered badly above 1.5 mg/l, and therefore, the interference by formulated detergents containing tripolyphosphate was large. The fluoride ion activity electrode method is the most suitable procedure for the determination of fluoride in polluted waters containing surfactants. (Henley-ISWS)
W77-05431

INSTRUMENTS FOR STUDYING OCEAN POLLUTION,
Southern California Coastal Water Research Project, El Segundo.
W. Bascom.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE1, Proceedings Paper 12715, p 1-8, February 1977. 4 fig, 1 tab.

Descriptors: *Pollutant identification, *Pollutants, *Sampling, *Oceans, *Instrumentation, Surveys, Surveying instruments, Equipment, Photography, Cameras, Water pollution, Trace elements, Pesticides, Chlorinated hydrocarbon pesticides, Sewage effluents, Trawling, Pollution, Mussels, Oceanography.
Identifiers: *Ocean pollution, Drogues, Trawls, Samplers, Water samplers, Grab samplers, Underwater television, Underwater cameras, Marine engineering.

This paper described a number of instruments used to take samples or to make measurements necessary for the study of pollution in inshore coastal waters. Extreme care in sampling is required when measurements of trace elements must be made in the range of a few parts per billion, and also when measurements of pesticides at a few parts per trillion must be made. The amount of uptake of pollutants into marine animals, of aerial fallout of lead and DDT on the water surface, and of the motion of water masses can be measured only if the scientist is properly equipped. Some of this equipment is rapidly changing; the television which was satisfactory only 2 years ago has been outclassed by the 1976 models. Even very simple-appearing pieces of equipment, such as grab samplers, can produce very different results. It was concluded that the accent must be on thoughtfulness and on careful work at sea. (Sims-ISWS)
W77-05448

A SPECIFIC CONDUCTANCE METHOD FOR QUALITY CONTROL IN WATER ANALYSIS,
Lancaster Univ., Bailrigg (England). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2K.
W77-05453

BIODEGRADABILITY OF ORGANIC COMPOUNDS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5B.
W77-05483

MEASUREMENT OF AND CALIBRATION FOR GAMMA SPECTROSCOPY OF MISSISSIPPI RIVER WATER,
Louisiana State Univ., Baton Rouge. Dept. of Nuclear Engineering.
O. W. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 708, Price codes: A03 in paper copy, A01 in microfiche. M.S. Thesis, August 1976. 34 p, 9 fig, 5 tab, 16 ref. OWRT A-039-LA(1). 14-34-0001-6019.

Descriptors: *Radioactivity, Potable water, *Mississippi River, Measurement, *Calibration, *Louisiana, *Pollutant identification, *Spectroscopy.
Identifiers: Gamma spectroscopy.

Natural sources and industrial operations are known to introduce radioactive materials into the Mississippi River. Public health implications of these materials have prompted studies yielding limited information on gross activities and specific radionuclide inventories. An investigation was undertaken to extend qualitative and quantitative knowledge of specific radionuclides in river water through the application of gamma-photon scintillation spectrometery. Raw river-water samples, collected from the intake pipe at a Jefferson Parish water treatment plant, were counted a one-liter aliquots in a Marinelli beaker for 12 hours with a 4-inch by 4-inch NaI(T1) crystal housed in a large grated-steel shield. Net peak areas from multichannel analyzer data for gamma energies of interest were obtained by subtraction of 12-hour background counts. A novel technique for establishing counting yield as a function of energy was developed to obtain both energy baseline and

quantitative information from sample gamma spectra. This technique involved activation of selected target nuclides by Californium-252 neutrons, with the product radionuclides first being quantitated by point-source counting, and then dissolved for counting as one-lieter samples in the Marinelli beaker to provide empirical counting-yield data. Only naturally-occurring radionuclides were detected, with Potassium-40 being the major contributor; up to 90 picocuries per liter of this radionuclide were observed. Suggested improvements in methodology include use of large-volume semiconductor detectors and longer counting times to obtain greater specificity and sensitivity.
W77-05486

THE USE OF REMOTE SENSING IN A STUDY OF SUBMERGED AQUATIC MACROPHYTES OF THE PAMLICO RIVER ESTUARY, N.C.,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
J. E. Harwood.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 742, Price codes: A05 in paper copy, A01 in microfiche. M.A. Thesis, August 1975. 75 p, 20 fig, 10 tab, 48 ref. OWRT A-077-NC(5). 14-31-0001-5033.

Descriptors: *Aquatic plants, *Remote sensing, *Aquatic biomass, *Aerial photography, Aquatic vegetation, Rooted aquatic plants, *Pollutant identification.
Identifiers: *Pamlico River Estuary(NC), Multispectral photography, Ground truth data, Plant density, *Macrophytes.

The feasibility of using serial photography from fixed winged aircraft to differentiate species of aquatic macrophytes and estimate their biomass was investigated. A Spectral Data Model 10 multispectral camera with Kodak Infrared Aerographic 2424 film and a hand-held 35 mm camera with panchromatic, color, and color-IR film were used during four flights along the shallow margins of the Pamlico River estuary during the summer and fall, 1973. Remote sensing flights were made in conjunction with the acquisition of ground truth data from 27 transects randomly located in the upper one-half of the river. Ground truth consisted of species density, water depth, perpendicular distance from shore, and turbidity. Submerged plant beds were discernible with all film types but less desirable results were obtained in the near-IR band of the multispectral photography. Even though biomass estimates were not possible wit existing techniques, two species, Vallisneria americana and Potamogeton perfoliatus var. bupleuroides, were differentiated using color patterns due in part to differences in plant density and growth form. Twelve different combnations of species were observed during the study. Vallisneria americana was the dominant species in the estuary and was found in 83% of all quadrats containing vegetation either as a single species of in combination with one or more species. (Stewart-North Carolina State)
W77-05487

STUDIES ON THE DISTRIBUTION OF 14 C LABELLED PCB IN THE BODY. II. THE DISTRIBUTION IN GOLD FISH (CARRASIUS AURATUS), (IN JAPANESE),
Nihon Univ., Tokyo. Lab. of Veterinary Hygiene.
For primary bibliographic entry see Field 5C.
W77-05488

POWER PLANTS, CHLORINE AND ESTUARIES,
Environmental Research Lab., Narragansett, R.I.
For primary bibliographic entry see Field 5C.
W77-05491

DETERMINATION OF HARMFUL HEAVY METALS IN PLATING WASTE WATERS (MEKKI HAISUI CHU NO YUGAISEI KINZOKU NO TEIRYO),
Tokyo Metropolitan Research Lab. of Public Health (Japan).
T. Yoshihara, C. Okumoto, K. Terajima, M. Nagashima, and I. Toyama.
Tokyo Toritsu Eisei Kenkyujo Kenkyu Nenpo, Vol. 27, No. 1, p 91-95, 1976. 1 fig, 2 tab, 18 ref.

Descriptors: Analytical techniques, *Heavy metals, *Spectrophotometry, Polarographic analysis, Waste water treatment, Water pollution sources, Industrial wastes, Cadmium, Zinc, Copper, Nickel, Chromium, Metals, *Pollutant identification.
Identifiers: Atomic absorption spectrophotography, Square-wave polarography, *Plating waste waters.

A method is described for the analysis of waste water from the plating process. Metals determined are chromium (VI), copper, zinc, cadmium, and nickel. A micro amount of chromium (VI) was extracted as diethyldithiocarbamate complex, by methylisobutylketone at pH 5. Determination was by atomic absorption spectrophotography. Repeaded tests showed a recovery of 93.5% and a coefficient of variation of 3.8%. Other metals were determined by square-wave polarography simultaneously in 1M-ammoniumchloride-ammonia aqueous solution. Spiked sample analysis revealed recoveries and coefficient of variations of 94.6% and 1.0% for copper; 94.6% and 1.6% for zinc; 95.2% and 2.6% for nickel; and 94.1% and 2.1% for cadmium. (Collins-FIRL)
W77-05507

DETERMINATION OF PHENOLS AT RESIDUAL LEVELS BY ULTRAVIOLET ELECTRONIC SPECTRA (DETERMINAREA FENOLILOR DIN APELE REZIDUALE CU AJUTORUL SPECTRELOR ELECTRONICE IN ULTRAVIOLET),
N. Mosescu, G. Kalmutchi, and V. I. Pop.
Revista de Chimie, Vol. 27, No. 10, p 897-899, 1976. 3 fig, 4 tab, 2 ref.

Descriptors: *Waste water treatment, *Oil industry, *Phenols, Separation techniques, Distillation, Ultraviolet radiation, Analysis, Treatment, Environmental control, Water pollution sources, *Pollutant identification.

The determination of phenols in refinery waste waters was investigated. A new method employing electronic spectra (bands from 222 nm and 269 nm) was tested on water samples with sulfides and non-volatile phenols removed by distillation. Statistical analysis proved the method comparable with the limits of other spectral methods. Surface waters may be analyzed with this method of interferences and the absorption coefficient of the water has been determined. (Collins-FIRL)
W77-05510

ON THE DETERMINATION OF COD, BOD, AND TOC IN THE FILTRATE OF SUSPENSIONS FROM PULP, PAPER, AND WASTE PAPER (UBER DIE BESTIMMUNG VON CSB, BSB UND TOC AM FILTRAT VON SUSPENSIONEN AUS HALBSTOFF, PAPIER UND ALTPAPIER),
L. Goettsching, H. L. Dalpke, and H. von der Heyde.
Das Papier, Vol. 31, No. 1, p 1-11, 1977. 4 fig, 4 tab, 6 ref.

Descriptors: *Filtration, Pulp and paper industry, Waste treatment, Industrial wastes, Suspended solids, *Carbon, *Organic matter, Effluents, *Waste water treatment, Analysis, *Pollutant identification, *Pulp wastes, *Chemical oxygen demand, *Biochemical oxygen demand.
Identifiers: *Total organic carbon.

A test procedure for determining COD, BOD, and TOC was presented. It was suggested that waste water analysis be extended to determine salt content as well as the parameters mentioned above. The procedure described dissolving organic matter with the aid of pulp, paper, and waste paper suspension filtrates. Accumulated parameters were indicated by g 02/kg of solid matter and/or g C/kg of solid matter. COD values were given for pulp, wood pulp, wood-containing and wood-free papers, and waste paper. (Collins-FIRL)
W77-05517

THE EFFECTS OF ORGANIC AND NUTRIENT ENRICHMENT ON THE BENTHIC MACROINVERTEBRATE COMMUNITY OF MOGGILL CREEK, QUEENSLAND (AUSTRALIA),
Environment Science and Services, Brisbane (Australia).
For primary bibliographic entry see Field 5C.
W77-05529

OIL POLLUTION COMPLIANCE MONITOR,
Exxon Research and Engineering Co., Linden. (Assignee).
J. O. Moreau.
U.S. Patent No. 3,985,020, 9 p, 10 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 951, No 2, p 507, October 12, 1976.

Descriptors: *Patents, *Oil pollution, *Monitoring, *Measurement, *Water pollution, *Water pollution sources, Oily water, Oil wastes, *Pollutant identification.
Identifiers: Tankers, Lipophilic belt.

Proposed international regulations in the oil pollution area contemplate limiting both the total oil and rate of oil which can be discharged by a tanker into the ocean. It is likely that these regulations may further require that the tanker be able to prove that it has not discharged oil in the ocean above the prescribed limits. An oil pollution compliance monitor which satisfies these needs provides a system which makes it possible to measure not only low oil concentrations, but also to determine rate of oil discharged and/or total volume of oil discharged during a tanker's voyage. The monitor comprises a sample manifold for contacting an oil absorbing tape with a sample from the oil discharge stream, such that oil concentration, the rate of oil discharged and the total volume of oil discharged can be directly determined from analysis of the tape. A belt of lipophilic tape is pulled from a supply reel at a constant speed through or beneath a manifold which holds an oil water sample and dispenses the sample into contact with the tape as it passes below. The tape is collected and stored on a suitable takeup reel which may be propertly stored to minimize deleterious effects of vaporization, oxidation and biodegradation of the oil (Sinha-OEIS)
W77-05600

5B. Sources Of Pollution

ICE GROWTH IN DULUTH-SUPERIOR HARBOR,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 2C.
W77-05129

ATMOSPHERIC DISPERSION CHARACTERISTICS IN THE LOUISIANA COASTAL ZONE,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5A.
W77-05132

MISSISSIPPI SOUND SALINITY DISTRIBUTION AND INDICATED FLOW PATTERNS,
Gulf Coast Research Lab., Ocean Springs, Miss. Physical Oceanography Section.
For primary bibliographic entry see Field 2L.
W77-05135

HYDROCARBONS IN THE OCEAN,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
E. P. Myers, and C. G. Gunnerson.
Special Report, April 1976. 46 p, 29 fig, 60 ref, 7 microfiche.

Descriptors: Water pollution sources, *Oil spills, *Baseline studies, *Organic compounds, Oceans, Resources development, *Path of pollutants, *Oil pollution.
Identifiers: *Petroleum hydrocarbons, Marine environment, Biogenic hydrocarbons.

Available information is summarized on baseline levels of hydrocarbons in ocean waters. The data indicate that, although hydrocarbon concentrations vary over several orders of magnitude, the majority of surface and near-surface measurements are in the range of about 1 to 10 parts per billion. Compositional information indicates that cycloparaffins are the predominat hydrocarbon type, followed by iso-paraffins and aromatics. The measurements of hydrocarbons in deeper ocean waters generally indicate levels less than measured in surface and near surface waters, with many values less than 1 ppb. In general, coastal waters, for which there are greater potentials for hydrocarbon inputs, exhibit slightly higher levels than are detected in open ocean waters. Open ocean waters that are frequented by tanker traffic also exhibit slightly higher levels than are measured for less frequently traveled ocean waters. The hydrocarbon measurements on ocean waters indicate a pervasive distribution of both petroleum and biogenic hydrocarbons; however, the relative presence of biogenic hydrocarbons is more apparent in open ocean waters. (NOAA)
W77-05139

CARIBBEAN-ATLANTIC WATER EXCHANGE THROUGH THE ANEGADA-JUNGFERN PASSAGE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2L.
W77-05153

REMARKS ON THE SHORT TERM VARIABILITY OF THE PARAMETERS RELATING TO THE NUTRIENT AND OXYGEN BALANCE DURING THE SYNOPTIC INVESTIGATION OF SHALLOW INLETS DURING 1972, (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Marine and Fishery Biology.
For primary bibliographic entry see Field 5A.
W77-05159

FATE 2,4,5-T CONTAMINANT, 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD) IN AQUATIC ENVIRONMENTS,
Wisconsin Univ., Madison. Dept. of Entomology.
For primary bibliographic entry see Field 5A.
W77-05170

DISTRIBUTIONS OF WATER AND HERBICIDE IN LAKELAND SAND DURING INITIAL STAGES OF INFILTRATION,
Florida Univ., Gainesville. Dept. of Soil Science.
A. Elzeftawy, R. S. Mansell, and H. M. Selim.
Soil Science, Vol. 122, No. 5, p 297-307, November 1976. 9 fig, 4 tab, 14 ref. OWRT A-026-FLA(11).

Descriptors: *Path of pollutants, *Infiltration, *Soil water movement, *Herbicides, Model studies, Mathematical models, Laboratory tests, Solutes, Aqueous solutions, *2,4-D, Irrigation, Soil water, Florida, Tracers, Moisture content, Sands, Soils, Soil physical properties, Soil science.
Identifiers: Solute transport, Lakeland sands(Fla).

Penetration depths and concentration distributions were determined in columns of Lakeland sand for surface-applied 2,4-D herbicide during initial stages of steady water infilration. Water was applied, with application rates, R, of 2 and 4 cm/hr, to soil with initial water contents, theta sub i, of 0.20, 0.11, and 0.01 cu cm/cu cm. Increasing R resulted in faster rates of advance for both the water wetting fronts and the depths of 2,4-D peaks. Larger values of theta sub i, however, increased the rate of advance for the wetting front but did not affect the location for 2,4-D peaks. Penetration of 2,4-D peaks per unit of water applied to the soil was observed to be independent of both R and theta sub i during initial stages of water infiltration. Distributions of 2,4-D concentration, as calculated from water and solute transport equations, were observed to lag slightly behind experimentally measured distributions. (Sime-ISWS)
W77-05180

THE CHEMISTRY OF LEAD AND CADMIUM IN SOIL: SOLID PHASE FORMATION,
Utah State Univ., Logan. Dept. of Soil Science and Micrometeorology.
J. Santillan-Medrano, and J. J. Jurinak.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p 851-856, September-October 1975. 8 fig, 2 tab, 17 ref. OWRT A-014-UTAH(2).

Descriptors: *Lead, *Cadmium, *Soil investigations, *Soil chemistry, Chemical reactions, Path of pollutants, Water pollution sources, Soil analysis.
Identifiers: *Equilibrium solubility diagram.

Equilibrium batch studies were conducted to obtain solubility data of Pb and Cd in soils. The data were plotted on equilibrium solubility diagrams using pH as the master variable. In the construction of the diagram the hydroxide, carbonate, and phosphate compounds of Pb and Cd were given particular attention. Both Pb and Cd solubility decreased in the soils as pH increased. The lowest values were obtained in the calcareous soils. Under a given set of conditions, however, Cd activity in solution was always notably greater than that of Pb. (Skogeroe-Colo St)
W77-05202

DIQUAT AND ENDOTHALL: THEIR FATES IN THE ENVIRONMENT,
Wisconsin Univ., Madison. Water Resources Center.
G. V. Simsiman, G. Chesters, and T. C. Daniel.
Residue Reviews, Vol. 62, p. 131-174, 1976. 1 fig., 7 tab., 166 ref. OWRT B-016-WIS(19). 14-01-001-1567.

Descriptors: *Herbicides, *Diquat, *Path of pollutants, Aquatic weed control, Mode of action, Soils, Sorption, Clay minerals, Degradation(Decomposition), Pesticide residues, Water, Persistence, Bottom sediments, Translocation, Toxicity, Rates of application.
Identifiers: *Endothall.

The adsorption and movement, degradation, persistence and absorption of two herbicides in soils, plants, animals, and aquatic systems is delineated as well as their toxicty to mammals, fish, and invertebrates. Methodologies of extracting and identifying residues in various materials are included, although inadequate methods of determining low levels of endothall in soils and sediments limit investigations regarding its ecological fate. Preferential adsorption of diquat by clay minerals, particularly montmorillonite, significantly reduce the microbial and photochemical degradation processes in soils and water; it is also readily adsorbed by organic matter. Diquat residues may undergo rapid photodegradation on exposure to sunlight after appliation. It is rapidly dissipated from water and is probably bound in bottom sediments. It is not accumulated in harvested crops nor by mammals. Endothall, subject to leaching in soils, is rapidly microdegraded to nontoxic products in soils and water. It is metabolized by plants and fish but mammals excrete it largely as the bound form. A recommended application rates of endothall, no chronic or toxic effects have been observed in mammals, fish, and sesveral species of invertebrates. Diquat is effective against a broader spectrum of aquatic weeds than endothall; both herbicides have high margins of safety at prescribed applications and precautions. The alkylamine derivatives of endothall are highly toxic to aquatic fauna thus limiting their user for aqutic weed control. (Auen-Wisconsin)
W77-05204

SEDIMENTATION IN THE LAKE OF TUNIS: A LAGOON STRONGLY INFLUENCED BY MAN,
Duke Univ., Durham, N.C. Dept. of Geology.
W. Harbridge, O. H. Pilkey, P. Whaling, and P. Swetland.
Environmental Geology, Vol 1, No 4, p 215-225, 1976. 9 fig, 2 tab, 28 ref. OWRT B-071-NC(1).

Descriptors: *Sedimentation, *Bottom sediments, *Lagoons, *Sediment control, *Water pollution, Sediments, Calcareous soils, Lakes, Bodies of water, Eutrophication, Water pollution effects, Waste water(Pollution), Drainage water, Drainage practices, Effluents, Arid lands, Precipitation(Atmospheric), Evaporation, Sewage, Sludge, Algae.
Identifiers: *Tunisia(Lake of Tunis).

An investigation was conducted to determine the parameters of sedimentation and the nature of the sediment of the Lake of Tunis lagoon system. The climate in the region is arid, and potential evaporation exceeds average precipitation. The lagoon system studied is highly polluted, partially as a result of man's activities in the area over a long period of time. The principle sources of sediment are sewage sludge and fill, calcareous marine organisms, including abundant worm reefs, and local intermittent streams. More than 100 grab samples were taken from the lagoon bottom and laboratory tests conducted on the samples. Surface temperature and salinity in the lagoon were measured during summer and winter. The results are presented. Water characteristics of the lagoon and worm reefs are also discussed. The sediments discovered in the samples taken are divided into mud, sand-size sediments, CaCO3, and heavy metals and discussed in detail. Solutions proposed for reducing pollution of the lake include improved sewage treatment, harvesting algae, widening channels, building stabilization ponds to digest sludge, and the building of a pumping station and canal to carry effluent to the sea. (Jamail-Arizona)
W77-05206

CONTROL OF SALT-WATER INTRUSION BY RECHARGE WELLS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W77-05207

AQUATIC ALGAE AS A DIFFUSE SOURCE OF BACTERIAL CONTAMINATION IN NATURAL WATERS,
Montana State Univ., Bozeman. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W77-05211

CHANGES IN THE QUALITY OF SOIL WATER FOR THREE YEARS FOLLOWING BURNING,
Montana Univ., Missoula. School of Forestry.
For primary bibliographic entry see Field 4C.
W77-05212

ANNUAL BENTHIC BIOMASS DISTRIBUTION IN A HIGH-MOUNTAIN LAKE (VORDERER FINSTERTALER SEE, TYROL, AUSTRIA),
For primary bibliographic entry see Field 5C.
W77-05223

BACTERIAL DISTRIBUTIONS IN LAKE ERIE (1967, 1970),
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-05227

THE DISTRIBUTION AND RELATION OF PARTICULATE ORGANIC MATERIAL AND PRIMARY PRODUCTIVITY IN THE GEORGIA BIGHT, 1973-1974,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5C.
W77-05232

ALLOWANCE FOR THE VARIABILITY OF DISCHARGES IN COMPUTATIONS OF THE DILUTION OF WASTE WATERS IN RIVERS,
L. I. Faustova.
Soviet Hydrology: Selected Papers, No. 3, p. 179-181, 1974. 5 ref. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 210, p. 151-154, 1974.

Descriptors: *Waste dilution, *Streamflow, *Measurement, Rivers, Equations, Probability, Hydraulic properties, Water pollution, Path of pollutants, Methodology.

A method is proposed of using discharge probability curves to analyze the effect of the rivers's hydrological characteristics on the rate of pollution. The method incorporates an average duration curve constructed on the basis of tables of daily discharges for each year and of subsequent averaging of the ordinates of equal duration for all years. The method estimates dilution of waste waters in rivers by primarily incorporating the intra-annual variations of river discharges. In computing dilution, allowances are made for variations in time of all the elements of flow, i.e., discharge, current velocity, depth, etc. When hydraulic flow elements vary relatively smoothly, their real chronological curves can be replaced by stepped curves, assuming that flow is steady within each time interval and the changes are jump-like from interval to interval. Thus, dilution can be computed for individual intervals by the method used to compute a steady-state process, and it is possible to determine how concentration of a pollutant in a flow changes from interval to interval with river flow for a constant waste water discharge. For steady-state dilution, the final effects of the mixing of the pollutant for i-th time interval can be estimated from the average pollutant concentration in the flow downstream of the wastewater discharge site in a cross section of sufficient mixing. Equations illustrate this methodology. (Auen-Wisconsin)
W77-05234

MODEL TO EVALUATE FEEDLOT RUNOFF CONTROL SYSTEMS,
Kansas State Univ., Manhattan. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-05238

ECONOMIC TRADE-OFFS TO LIMIT NON-POINT SOURCES OF AGRICULTURAL POLLUTION,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5G.
W77-05255

A PRACTICAL METHODOLOGY FOR RIVER QUALITY SIMULATION THROUGH THE STAGE-WISE GENERATION OF TRANSITION FUNCTION,
University of Petroleum and Minerals, Dhahran (Saudi Arabia). Dept. of Systems Engineering.
For primary bibliographic entry see Field 5G.
W77-05257

WATER-QUALITY CHARACTERISTICS OF SIX SMALL LAKES IN MISSOURI,
Geological Survey, Rolla, Mo. Water Resources Div.
J. H. Barks.
Missouri Department of Natural Resources, Rolla, Geological Survey, Water Resources Report No 33, 1976. 42p, 25 fig, 5 tab, 28 ref.

Descriptors: *Water quality, *Lakes, *Reservoirs, *Missouri, Limnology, Eutrophication, Trophic level, Chemical properties, Physical properties, Nutrients, Sedimentation, Geology, Land use, Water temperature, Turnovers, Thermal stratification, Lake ice.

A study of six small lakes, representative of those in the major physiographic regions of Missour, shows variation in physical, chemical and biological characteristics related to their location in the State. For example, because of climatic differences, ice cover and winter stratification are more prevalent in northern Missouri. Summer stratification lasts about one month longer in the southern than in the northern part of the State. Because of the difference in geology, lake water in the Plains area is more mineralized than in the Ozarks. Different geology and land use generally account for more sedimentation of Plains lakes. Lakes in the Plains area usually receive enough nutrients to be classified as mesotrophic or eutrophic while those in the Ozarks receive less nutrients from natural sources and are oligotrophic or mesotrophic. However, as seen from one of the study lakes, an oligotrophic lake can be made quite productive through the application of commercial fertilzers within the lake. (Woodard-USGS)
W77-05259

PROGRESS REPORT ON GEOLOGY OF THE EDWARDS AQUIFER, SAN ANTONIO AREA, TEXAS, AND PRELIMINARY INTERPRETATION OF BOREHOLE GEOPHYSICAL AND LABORATORY DATA ON CARBONATE ROCKS,
Geological Survey, San Antonio, Tex. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-05277

QUALITY-OF-WATER DATA, PALM BEACH COUNTY, FLORIDA 1970-1975,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-05279

UPPER JAMES RIVER BASIN WATER QUALITY MANAGEMENT PLAN.
Wiley and Wilson, Inc., Lynchburg, Va.
For primary bibliographic entry see Field 5G.
W77-05294

AGRICULTURE AND CLEAN WATER (PROCEEDINGS OF A CONFERENCE ON AGRICULTURAL WATER POLLUTION CONTROL),
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5G.
W77-05305

GROUND-WATER POLLUTION PROBLEMS IN THE NORTHWESTERN UNITED STATES,
Geraghty and Miller, Inc., Port Washington, N.Y.
F. van der Leeden, L. A. Cerrillo, and D. W. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 860, Price codes: A17 in paper copy, A01 in microfiche. Report EPA-660/3-75-018, (1975). 361 p, 60 fig, 48 tab, 459 ref, 3 append.

Descriptors: *Groundwater, *Groundwater resources, Pollution, *Water quality, Water quality control, Colorado, Idaho, Montana, Oregon, Washington, Wyoming, Return flow, Water pollution, *Pacific Northwest U.S.

An evaluation of ground-water pollution problems has been carried out in six states in the northwest: Colorado, Idaho, Montana, Oregon, Washington and Wyoming. Findings indicate that, with the exception of radioactive waste disposal, few cases of ground-water pollution have been investigated in detail. There is a need for baseline water-quality data and systematic evaluation of overall groundwater conditions, especially in urban zones, in areas of petroleum exploration and development, and at locations of mining and industrial activity. The most common natural ground-water quality problems, other than high salinity, are excessive hardness, iron, manganese, and fluoride. Principal sources of man-caused ground-water quality problems in the approximate order of severity are: discharge of effluent from septic tank and sewage treatment plants, irrigation return flow, dryland farming, abandoned oil wells, shallow disposal wells, unlined surface impoundments, mine tailings and mine drainage, municipal and industrial landfills, and radioactive waste disposal. Other sources that appear to be of less importance but still must be considered include: spills and leaks, application of fertilizers and pesticides, feedlots and salt-water intrusion. (Skogerboe-Colo St)
W77-05307

USE OF GEOTHERMAL WATER FOR AGRICULTURE,
Utah State Univ., Logan.
For primary bibliographic entry see Field 3C.
W77-05309

ON THE RUN-OFF CHARACTERISTICS IN THE NIGORI RIVER AND OHORA RIVER BASINS CONSIDERED BY THE SURFACE RUN-OFF (HYOMER RYUSHUTSU O KANGAETA NIGORI GAWA OYOBI OHORA GAWA RYUIKI NI OKERU SHUSUI TOKUSEI NI TSUITE),
For primary bibliographic entry see Fjeld 2E.
W77-05320

AN EXPERIMENTAL AND SIMULATION STUDY OF WASTE EFFLUENT FILTRATION THROUGH SOIL,
Massachusetts Univ., Amherst.
K. V. Lo.
Available from University Microfilms, Inc., Ann Arbor, Michigan, Order No. 76-5283. Ph.D. Thesis, 1975, 186 p.

Descriptors: Waste water treatment, *Filtration, Soil water movement, Model studies, Phosphorus, Nitrogen, Soil types, Denitrification, *Path of pollutants, Water pollution sources, Simulation analysis.

The effects of waste water effluent application rates and frequencies on waste water renovation

through soil media was studied with soil columns. Chemical analyses were made of soil, waste water and filtrate samples, and bench tests were conducted to determine nutrients adsorption properties of various soils. Mathematical models were made of waste water movement in soil columns for infiltration and redistribution and moisture profiles were determined. Tests revealed that all columns achieved a 99% or better phosphorus removal. Phosphorus from applied secondary effluent accumulated in the top 1.0-2.5 inches of the columns, depending on loading. At the end of the study, nitrogen levels were below the recommended limit of 10 ppm for drinking water. Denitrification was significant in nitrogen removal. (Collins-FIRL)
W77-05321

LANGUAGE FOR MODELING HYDROBIOLOGICAL PROCESSES, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
V. V. Menshutkin.
Gidrobiol Zh 11(6), p 11-17, 1975.

Descriptors: *Bacteria, *Model studies, Phytoplankton, Protozoa, Ecosystems, Algorithms, Digital computer, Computer programs.

A language was developed for the description of modeling algorithms of hydrological system models. The language is based on the energy balance and materials cycle in the water ecosystem (protozoa, phytoplankton and bacteria are mentioned). The computer 'Dnepr-21' was used though, in principle, any average digital computer may be substituted.--Copyright 1976, Biological Abstracts, Inc.
W77-05329

ENGINEERING, SANITARY AND MUNICIPAL MODELING, IDENTIFICATION AND CONTROL OF A DYNAMIC AND STOCHASTIC CHEMICAL BIOLOGICAL PROCESS,
Wisconsin Univ.-Madison.
For primary bibliographic entry see Field 5D.
W77-05330

TREATMENT OF LEACHATES FROM SANITARY LANDFILLS,
Washington Univ., Seattle.
For primary bibliographic entry see Field 5D.
W77-05331

BIOCHEMICAL REACTOR ANALYSIS,
Rutgers - The State Univ., New Brunswick, N.J. Coll. of Engineering.
For primary bibliographic entry see Field 5D.
W77-05334

STAGE, DISCHARGE AND QUALITY CHANGES IN A WATER TABLE AQUIFER RELATED TO URBANIZATION,
Toledo Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 4C.
W77-05335

DISPERSION OF WATER POLLUTANTS IN A TURBULENT SHEAR FLOW,
Stone and Webster Engineering Corp., Boston, Mass.
G-T. Yeh, and Y-J. Tsai.
Water Resources Research, Vol. 12, No. 6, p 1265-1270, December 1976. 4 fig, 14 ref.

Descriptors: *Dispersion, *Pollutants, *Turbulent flow, *Model studies, Mathematical models, Water quality, Rivers, Streams, Velocity, Diffusivity, Flow, Streamflow, Analytical techniques, Water pollution sources, *Path of pollutants.
Identifiers: *Turbulent shear flow.

A steady state, two dimensional turbulent diffusion equation describing the concentration distribution of a substance from a line source in a shear flow field was solved analytically. A similar formulation may be developed for any other kinds of sources. In the study, the velocity and eddy diffusivity were assumed to be variables given by the power law approximations, and the depth of the water body was assumed finite, with no-flux boundary conditions applied at the water surface and bottom. This represents a first step toward analytical water quality modeling, which realistically includes the effects of both the finiteness in water depth and the nonhomogeneity in velocity and diffusivity. Results from the present model were compared with those obtained from the finite depth constant coefficient model and from the infinite depth constant coefficient model. They showed significant and realistic differences in the prediction of concentration patterns. The effects of nonhomogeneous velocity and diffusivity are cancelled out by the effect of boundary reflection far away from the source. (Sims-ISWS)
W77-05346

AN X-Z HYDRAULIC/THERMAL MODEL FOR ESTUARIES,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
R. R. Boericke, and J. M. Hogan.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY1, Proceedings Paper 12669, p 19-37, January 1977. 11 fig, 25 ref, 2 append.

Descriptors: *Estuaries, *Thermal pollution, *Model studies, *Hudson River, Mathematical models, Density, Salinity, Temperature, Water temperature, Tides, Tidal waters, Powerplants, Dispersion, Rivers, Hydraulics, Circulation, Water circulation, Water pollution sources, Path of pollutants, *New York.

A two-dimensional, time-dependent numerical model for partially stratified estuaries was described. The model was based on a coupled solution to the continuity, momentum, and salinity equations in the longitudinal (x) and vertical (z) directions. The hydrostatic approximation was used, and the vertical exchange of momentum, mass, and energy was modeled with an eddy viscosity by using empirical modifications for stable and unstable stratification. The numerical method was a time and space staggered scheme, with the vertical direction treated implicitly. Convection terms in the transport equations were treated with upwind differencing. The model results showed good agreement with observed tidal phase lag, current, and salinity data. At low freshwater flows, the model predicts a large density-induced circulation (DIC), which strongly influences the dilution of thermal discharges. An important result was that the DIC is not monotonic, being much larger in the deep sections of the river due to recirculation. (Sims-ISWS)
W77-05358

THE LYCOMING COUNTY, PENNSYLVANIA, SANITARY LANDFILL: STATE-OF-THE-ART IN GROUND-WATER PROTECTION,
Giddings (Todd) and Associates, State College, Pa.
For primary bibliographic entry see Field 5G.
W77-05363

A CHARACTERIZATION OF URBAN STORMWATER RUNOFF IN BOULDER, COLORADO,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
V. Nilsgard, E. R. Bennett, and K. D. Linstedt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 710, Price codes: A09 in paper copy, A01 in microfiche. M. S. Thesis, 1976. 170 p. OWRT A-028-COLO(1), 14-34-0001-6006.

Descriptors: *Storm water, *Runoff, *Water quality, *Urban drainage, *Colorado, *Urban runoff, Water pollution sources, Pollution abatement, Snowmelt.
Identifiers: *Boulder(Colo).

This research was an initial study on urban stormwater runoff in Boulder, Colo. The objectives were to measure the pollutional characteristics of stormwater drainage, and to study its impact on the receiving water quality. Both snow-melt runoff and rainfall discharges were analyzed to characterize the stormwater with respect to physical and chemical parameters. The study provided the basis for developing a more complete picture of the need for stormwater pollution abatement in Boulder. (See also W77-05370)
W77-05369

POLLUTIONAL CHARACTERISTICS OF URBAN SNOWMELT RUNOFF,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
G. M. Battaglia.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 715, Price codes: A07 in paper copy, A01 in microfiche. M. S. Thesis, December 1976. 120 p, 25 fig, 18 tab, 57 ref, append. OWRT A-028-COLO(2), 14-34-0001-6006.

Descriptors: *Storm water, Runoff, *Water quality, *Urban drainage, *Snowmelt, *Urban runoff, *Colorado, Water pollution sources, Sewers, Urbanization, Cities.
Identifiers: *Boulder(Colo).

This research was the second of a two part study on urban stormwater runoff in Boulder, Colorado. The objectives were to give a representation of the concentrations and loadings of selected pollutants from snowmelt runoff, and their impact upon a receiving stream, Boulder Creek. A 183 acre residential area served by a separate storm and sanitary sewer system was selected. The storm sewer system discharges into Boulder Creek. The recorded snowfalls and subsequent runoff have been investigated for the fall and winter of 1975-76. Concentrations of urban stormwater runoff, pollutant variations in Boulder Creek, and loadings from the storm sewer were also evaluated during this period. Concentrations of the various chemical parameters in snowmelt runoff were highly variable, similar to rain runoff. These concentrations peaked during the middle of the day, corresponding with periods of maximum runoff. Pollutant concentrations in the storm sewer were usually below those found for rain runoff, but due to lower flows in the creek during the winter months, the detrimental effects from the sewer were as significant as those found in the previous rain runoff study. The impact of urban runoff upon receiving waters is brought into perspective when comparing the storm sewer discharge loadings with those of the municipal sewage treatment plant effluent. While adding only 13.5 percent of the total flow to the creek, the storm sewer contributes almost 50% of the total solids and lead, and over 75% of the suspended solids. (See also W77-05369)
W77-05370

RECYCLING OF SEWAGE EFFLUENT BY IRRIGATION: A FIELD STUDY ON OAHU, FINAL PROGRESS REPORT FOR AUGUST 1971 TO JUNE 1975.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W77-05372

CHARACTERIZATION OF SANITARY LANDFILL LEACHATES,
Norsk Institutt for Vannforskning, Blindern.
O. J. Johansen, and D. A. Carlson.

Water Research, Vol. 10, No. 12, p 1129-1134, 1976. 2 fig, 4 tab, 8 ref.

Descriptors: *Landfills, *Waste disposal, *Leachate, *Washington, *Disposal, *Water pollution sources, Sewage treatment, Analytical techniques, Leaching, Organic compounds, Decomposing organic matter, Water pollution, Water quality, Chemical analysis, Environmental sanitation, Biochemical oxygen demand, Chemical oxygen demand, Garbage dumps.
Identifiers: *Disposal fields, *Norway, Total organic carbon, Trace metals, Nitrogen content.

Described herein was composition of leachates from some sanitary landfills in Norway and in the U.S.A. The wide range of compositions found was attributed mainly to the efficiency of the various methods used to prevent water from entering the fills. Organic acids were found to contribute almost 90% of the total organics in the high strength leachates. The ratio of carbonaceous BOD to COD increased significantly with the concentrations of organics. Thus a better biological treatability is expected for the high strength leachates. High concentrations of nitrogen, manly as ammonia, prevailed in all the samples, while the concentrations of phosphorus were low. Of the heavy metals, iron was high in all the leachates, and zinc was found to be the next highest. The concentrations of chromium, nickel, copper, cadmium, and lead were low. (Henley-ISWS)
W77-05432

STATUS OF OCEAN DUMPING RESEARCH IN NEW YORK BIGHT,
MESA New York Bight Project Office, Stony Brook.
R. L. Swanson.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW1, Proceedings Paper 12722, p 9-24, February 1977. 7 fig, 2 tab, 34 ref, append.

Descriptors: *Oceanography, *Oceans, *New York, *New Jersey, Pollutants, Pollution abatement, Research and development, Waste, Sewage, Sewage bacteria, Sewage disposal, Sewers, Sewage effluents.
Identifiers: *Long Island, *Ocean dumping, *New York Bight, Bight Apex, Sewer outfalls, Atmospheric fallout, Vessel wastes, Spills.

The New York Bight extends seaward from Long Island and New Jersey to the edge of the continental shelf. Wastes from approximately 20,000,000 people are discharged to the Bight Apex. These wastes arrive by a variety of routes: ocean dumping, sewer outfalls, atmosphperic fallout, river discharges, land runoff, thermal discharges, vessel wastes, and occasional spills. Biotic aberrations in the Apex are more prevalent than in comparable coastal environments. Locally, ocean disposal of sewage sludge and dredge material could have been associated with these impacts. Comparable studies of existing ocean dumping practices and of proposed alternate ocean disposal sites nearly 65 nautical miles (120 km) out on the continental shelf were completed and reported in this study. (Roberts-ISWS)
W77-05443

THE HIGHWAY AS A SOURCE OF WATER POLLUTION: AN APPRAISAL WITH THE HEAVY METAL LEAD,
Lancaster Univ., Bailrigg (England). Dept. of Environmental Sciences.
D. P. H. Laxen, and R. M. Harrison.
Water Research, Vol. 11, No. 1, p 1-11, 1977. 4 tab, 109 ref.

Descriptors: *Lead, Pollutants, *Highways, *Heavy metals, Water pollution, Water quality, Gasoline, Air pollution, Public health, Toxicity, *Water pollution sources, Roads, Chemistry, Environmental effects, Soil contamination, Metals, Runoff, *Path of pollutants.
Identifiers: Anti-knock compounds, Pollutant dispersion.

Factors influencing the impact of highway lead on the quality of water resources were discussed, and the available information on each factor was evaluated critically. Hence, the sources of lead input to the highway environment were described, and the subsequent airborne and waterborne dispersal to the receiving waters was discussed in detail. It appears that the impact on surface waters is confined to the lead contained in surface runoff, as the lead dispersed to roadside soils is effectively immobilized in the top 10 cm of soil. The concentration of lead in highway runoff can reach levels far in excess of those normally encountered in surface waters. However, when evaluating the impact on the receiving waters, the importance of considering both the lead mass discharge from the highway and the subsequent dilution by the receiving water was stressed. Finally, the present inadequate understanding of the physiochemical forms of lead in polluted and natural waters was highlighted. (Henley-ISWS)
W77-05452

DISSOLVED NITROGEN AS A TRACER OF FISH MOVEMENTS,
British Columbia Univ., Vancouver.
H. H. Harvey.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie, No. 15, (1964), p 947-951, 14 fig.

Descriptors: Salmon, *Sockeye salmon, *Fish migration, Juvenile fish, Fish diseases, On-site investigations, *Hydrostatic pressure, Nitrogen, *Supersaturation, Equilibrium, Thermocline, *Fish physiology, Water temperature.
Identifiers: Cultus Lake, *Swimbladder, *Sockeye salmon smolts, Outmigration, *Embolism, *Gas bubble disease.

Sockeye smolts migrating out of Cultus Lake after the lake has stratified thermally, show a marked propensity to gas embolisms following sudden pressure reduction below atmospheric conditions. This state of the fish is associated with some period of residence in the lake at the depth of the thermocline or greater. Individual fish change temperature more rapidly than they equilibrate with the nitrogen of their environment. In late-migrating smolts, moving upward rapidly from the thermocline to the lake surface, the nitrogen content of the fish would approach 130 percent of air saturation. Nitrogen equilibration between fish and environment is too rapid for dissolved nitrogen to account for the slowly disappearing lethal factor shown by the late-migrating smolts. Bladderless fish and smolts with catheterized swimbladders are less prone to such embolisms on pressure reduction. No difference was found in the case of passage of gas through the pneumatic duct for surface and depth-held fish. No change in the swimbladder was observed such as to explain the seasonal change in mortality. (Katz)
W77-05461

THE GAS-BUBBLE DISEASE OF FISH, THE CAUSES, ATTENDANT PHENOMENA AND CURE, (DIE GASBLASENKRANKHEIT DER FISCHE, URSACHEN, BEGLEITERSCHEINUNGEN UND ABHILFE),
Zagreb Univ. (Yugoslavia). Morphologische-Biologische Institut.
For primary bibliographic entry see Field 5C.
W77-05474

THE GAS BUBBLE DISEASE OF FISH AND ITS CAUSE,
Brown Univ., Providence, R.I. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-05479

BIOCHEMICAL, MORPHOLOGICAL, AND PHYSIOLOGICAL STUDIES ON THE METHANE OXIDIZING BACTERIUM, METHYLOSINUS TRICHOSPORIUM, WITH EMPHASIS ON STRUCTURE, FUNCTION, AND COMPOSITION OF THE INTRACYTOPLASMIC MEMBRANES,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-05482

BIODEGRADABILITY OF ORGANIC COMPOUNDS,
Connecticut Univ., Storrs.
R. G. Bedard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 707, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, 1976. 84 p, 37 fig, 3 tab, 32 ref. OWRT A-030-CONN (10). 14-31-0001-3007.

Descriptors: *Biodegradation, *Organic compounds, *Organic wastes, *Refractivity, Biochemical oxygen demand, Sewage effluents, Pollutant identification.
Identifiers: *Refractory index, *Biological interference value, *Warburg respirometer test, *Biological oxidation, Acetic acid, Starch, Ethylene glycol, Carbaryl sevin, DDT, Bipyridine.

The quantitative measure used to describe the degradability of compounds was the Refractory Index (R.I.), interpreted as the degree of biodegradation of the compound. An R.I. of 1.0 indicated total degradation to natural aerobic end products of CO2, and H2O and NO3; and R. I. of zero indicated no biodegradation. The index used to describe a biointerference response was the Biological Interference Value (B.I.V.), interpreted as an apparent reduction in BOD exerted by the background sewage resulting from the prescence of the test compound in the sewage. A B.I.V. of 1.0 showed complete interference; a B.I.V. of zero indicated no interference. Many compounds were not completely degraded in the near optimal aerobic environment of the long-term Warburg Respirometer Test. Carbaryl sevin and ethylene glycol showed high removal through biological oxidation, while some naturally found compounds like starch and acetic acid, generally expected to undergo high biological oxidation, are reported as showing resistance and only 60% degradation (R.I.=6). Other naturally and industrially occurring compounds such as humics, gasoline and adenine underwent almost no degradation at all. In some cases, interference was shown to the biological process reducing the degradation of the background sewage by as much as 50% (B.I.V.=5). Such inhibitory responses were exhibited by compounds like DDT, bipyridine and cyanuric acid. (de Lara-Conn)
W77-05483

DISTRIBUTION OF BENTHIC MACROINVERTEBRATES IN AN ARTIFICIALLY DESTRATIFIED RESERVOIR,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
C. J. Ferraris, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 714, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, May 1976. 51 p, 1 fig, 19 tab, 38 ref, append. OWRT A-059-OKLA(2).

Descriptors: *Oklahoma, Reservoirs, *Distribution, *Benthos, Invertebrates, Thermocline, *Destratification, Aeration, Profundal zone, Diptera, Data collections, Sampling, Water quality control.
Identifiers: *Ham's Lake(Okla), Species diversity, Sialis sp, *Artifical destratification.

A total of 76 species of benthic macroinvertebrates was collected. The composition and den-

sity of the benthic assemblage was similar to that of other Oklahoma reservoirs. The number of species and density of macroinvertebrates decreased from March to the end of July 1975. Species diversity, probability of interspecific encounter, and biomass did not change significantly with time. Number of species, species diversity, and probability of interspecific encounter decreased with depth on all sampling times. The most pronounced changes occurred between 4 and 5 m during periods of thermal stratification and hypolimnion anoxia. Density and biomass of the assemblage decreased with depth, but the decrease could not be directly related to the physicochemical conditions of the lake. Artificial destratification removed the thermocline from Ham's Lake within 2 weeks. Destratification and aeration enabled species of chironomids and Sialis to recolonize the profundal zone, thus increasing the number of species, density, and species diversity of the profundal benthos. Since increased species diversity has been associated with healthier environments, it was concluded that artificial destratification increased the quality of the profundal zone of Ham's Lake.
W77-05485

COMPONENT COMPOSITION AND TRANSFORMATION AND WATERSOLUBLE ORGANIC SUBSTANCE IN BOTTOM SOILS OF THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
I. K. Palamarchuk, Ya. I. Bass, and B. I. Nabivanets.
Gidrobiol Zh 12(2), p 13-21, 1976.

Descriptors: *Organic compounds, *Proteins, *Organic acids, Reservoirs, *Bottom sediments, *Amino acids, Water pollution sources.
Identifiers: Russian-Sfsr, USSR, *Sugar, *Kremenchug Reservoir(USSR).

Compared with short-term recurrent flooding condition, (in the Russian SFSR, USSR) underwater conditions and constant flood favor the accumulation of biochemically unstable watersoluble organic compounds from a group of bound and free sugars, proteins, volatile organic acids and amino acids (to 4.6 plus or minus 1.0% on the average against 2.4 plus or minus 1.2% for readily hydrolyzable fractions). (Briefly mentions role of microflora in using certain compounds as energy source.)--Copyright 1976, Biological Abstracts, Inc.
W77-05492

DISAPPEARANCE AND MIGRATION OF PROPANIL AND ITS METABOLITE 3,4-DICHLORANILINE IN AN IRRIGATED LANDSCAPE, (IN RUSSIAN),
Akademiya Nauk SSSR, Pushchino. Inst. of Agrochemistry and Soil Sciences.
M. S. Sokolov, L. L. Knyr, M. I. Nevzorov, B. A. Kryzhko, and A. P. Chubenko.
Izv Akad Nauk Sssr Ser Biol 2, p 171-181, 1976.

Descriptors: *Organic compounds, *Irrigated land, *Path of pollutants, *Herbicides, Migration, *Rice, *Enzymes, *Soil microorganisms, Microbial degradation.
Identifiers: *Dichloraniline, *Propanil.

The disappearance rate and migration of the herbicide propanil and 3,4-dichloraniline (3,4-DCA) were studied under the conditions of rice irrigated systems (lower reaches of the Kuban river (USSR)). The destruction of the compounds was largely due to soil microorganisms and enzymes and to insolation and the action of the rice plants. Only 1% of the total amount of the compounds was leached into the drainage. The toxicants were detected in drainage and soil water at an acceptable concentration level or lower in the course of the entire rice growing season.--Copyright 1976, Biological Abstracts, Inc.
W77-05495

FIELD STUDIES ON THE SURVIVAL OF COLIFORMS AND E. COLI IN SEAWATER,
South Australia Engineering and Water Supply Dept., Salisbury. Water and Water Pollution Control Lab.
R. P. Waters.
Water (Journal of the Australian Water and Wastewater Association) Vol. 3, No. 4, p. 22-26, December 1976. 8 fig, 2 tab, 14 ref.

Descriptors: *Sewage bacteria, *Sea water, *Mortality, *Sewage disposal, *Coliforms, *E. coli, Waste dilution, Seasonal, Water temperature, Australia.
Identifiers: Mount Gambier(S.A.), Port McDonnell(S.A.).

Untreated sewage from Mount Gambier, South Australia, is discharged into the sea near Port McDonnell. As part of studies relating to a proposed upgrading of the discharge system, the time for 90 per cent disappearance of initial numbers of indicator bacteria (T90) was determined for various dilutions of sewage in seawater in a simulated marine environment. The T90 times varied widely with seasonal temperature, being shortest in summer. For E. coli, the summer T90 times ranged from 1.9 for a 1-in-500 sewage-seawater dilution to approximately 8 hr for a 1-in-20 dilution. The equivalent winter range was 5.5 to 45.5 hr. A similar pattern was recorded for 'total coliforms'. The significance of the results is discussed; their application to a theoretical outfall model would depend on other factors affecting the distribution of the sewage in the marine environment. (CSIRO)
W77-05530

5C. Effects Of Pollution

THE EFFECT OF WATER TEMPERATURE ON ECOLOGICAL PROCESSES IN A RESERVOIR RECEIVING HEATED WATER,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
A. Witt, Jr., R. S. Campbell, G. P. Busacker, T. H. Chen, and C. W. Esterby.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 191, Price codes: A02 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, January 27, 1977. 9 p, 7 ref. OWRT B-039-MO(8). USDI-OWRR-14-31-0001-3296.

Descriptors: *Thermal pollution, Reservoir, Reservoir fisheries, Age, Growth rates, Largemouth bass, Sunfishes, Channel catfish, Mayflies, Limnology, Primary productivity, Phytoplankton, Periphyton, Zooplankton, Benthos, Standing crops, Biomass, Fish farming, Water temperature, Heated water, Ecology, Water pollution effects.

Six studies were conducted on a 4,500-acre reservoir that receives heated water from a 475,000 kw power plant. The limnological and periphyton study indicated that the reservoir was light limited and of low productivity. The effect of the thermal effluent on zooplankton and benthos was negligible. Growth rates of largemouth bass and white crappie were apparently influenced more by turbidity and available forage fishes than by the thermal effluent. The effluent did attract and concentrate fishes during winter. Channel catfish were successfully cultured in floating cages in the heated water. The water was too cool for good growth during winter. The effluent had a sublethal effect on the fat composition of tissues and normal development of the gonads in the white crappie. These studies indicate that the thermal effluent had a minimal impact on the ecological processes within the reservoir.
W77-05108

ALGOLOGICAL OBSERVATIONS IN THE IDDEFJORD AND THE ADJACENT FJORD AREAS, S.E. NORWAY, (IN NORWEGIAN),
Oslo Univ. (Norway). Inst. of Marine Biology.
T. E. Lein, J. Rueness, and O. Wiik.
Blyttia 32(3), p 155-168, 1974.

Descriptors: *Algae, *Aquatic plants, *Fjords, *Toxicity, Pulp wastes, Industrial wastes, Sedimentation, Water pollution effects.
Identifiers: Ascophyllum-nodosum, Ceramuim-strictum, Fucus-vesiculosus, *Norway(Iddefjord).

The benthic vegetation of the Iddefjord and the adjacent coastal area outside the fjord was investigated from May 1972-Sept. 1973. Iddefjord is a threshold-fjord which is heavily polluted, chiefly due to organic wastes from a paper and pulp mill at Halden. The discharge of fresh water, mainly from the river Tista at Halden, produces a brackish surface layer, characterized by high turbidity and low salinities. The deeper water layers inside the sills are usually anoxic, and H2S containing water may rise to the surface. There is a marked decrease in the number of species from the outermost localities inwards, with minimum near Halden where no autotrophic algae were recorded. There is likewise a decrease in the lower limit of algal vegetation towards the inner parts of the fjord. The inner boundaries of fucoids are discussed according to gradients in environmental factors. Specimens of Fucus vesiculosus and Ascophyllum nodosum were transplanted to various places inside their present inner boundaries, and growth and development were compared with that of plants in the original population. Pollution effects rather than reduced salinity control the inner boundaries of fucoids and possibly other species in the fjord. Great rates of sedimentation of particular substances apparently exert a highly unfavorable effect on the benthic algae. A toxic effect of dissolved compounds in the water near Halden was suggested by growth experiments using the red alga Ceramuim strictum.
W77-05196

DIQUAT AND ENDOTHALL: THEIR FATES IN THE ENVIRONMENT,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5B.
W77-05204

THE USE OF OXYGEN DEFICIT MEASUREMENTS AS AN INDEX OF EUTROPHICATION IN TEMPERATE DIMICTIC LAKES,
W. R. Eberly.
Verhandlungen Internationale Vereinigung Limnologie, Vol.19, p. 439-441, 1975. 1 tab., 3 ref.

Descriptors: *Estimating, *Eutrophication, Measurement, *Dissolved oxygen, Hypolimnion, Oxygen sag, Lakes, Water pollution, *Pollutant identification.

As part of an effort to devise a simple and rapid means for identifying eutrophic lakes that can be singled out for more-detailed studies, a procedure is demonstrated for calculating the hypolimnetic oxygen deficit to aid in preliminary screening of a large number of lakes. Crude oxygen deficit values in excess of 100 g/sq m or areal crude oxygen deficit values in excess of 50 g/sq m indicatr severe eutrophic conditions. The concept is based on the premise that oxygen consumption due to decomposition of excess organic matter relates to one of the consequences of eutrophication; therefore oxygen deficit measurements, in comparison to most other indices, are more likely to indicate when eutrophication has become a problem, and to tell something about the degree of that problem. A crucial point is the initial saturation level used to determine the degree of oxygen depletion. The absolute oxygen deficit is based on the oxygen saturation at 4C at the spring overturn. Many lakes remain homothermal for a period, rising above 4C

before the beginning of stratification; therefore the absolute oxygen deficit would be too high. The relative oxygen deficit is based on oxygen saturation at the actual observed temperature following spring circultion--the highest homothermal temperature observed. The possibility that significant quantities of allochthonous organic matter is entering the hypolimnion or that there is any inorganic chemical oxygen demand should be taken into consideration during measurements. (Auen-Wisconsin).
W77-05222

ANNUAL BENTHIC BIOMASS DISTRIBUTION IN A HIGH-MOUNTAIN LAKE (VORDERER FINSTERTALER SEE, TYROL, AUSTRIA),
G. Bretschko.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1279-1285, 1975. 5 fig., 18 ref.

Descriptors: *Foods, *Productivity, *Benthos, *Biomass, *Distribution, Benthic fauna, Foreign research, Seasonal, Nematodes, Oligochaetes, Diptera, Microorganisms, Lakes, Limnology, Growth rates.
Identifiers: *Allochthonous material, *Vorderer finstertaler See(Austria).

In a study of Vorderer Finstertaler See(Austria), a dimictic, 15.76 hectare lake with a maximum depth of 28.5 meters and a mean depth of 14.8 meters, it was found that allochthonous material together with microflora is most likely thefood source for zoobenthos and therefore the regulating factor in annual benthic biomass distribution. Allochthonous material enters the lake in late June, July and August. It serves first as a substrate for bacterial and fungal growth. Through their activity, organic matter is transformed into a digestible state for zoobenthos. As this process is slow because of temperature and low nitrogen and phosphorus concentrations, the gap of two of three months between energy output and reaction of zoobenthos may be explained. Zoobenthos constitutents investigated at the lake included various species of nematoda, oligochaeta and chironomidae. Crustaceans and testaceans were not investigated. The lake basin is simply shaped, with steep slopes and a relatively large and flat depth area. The slope is dominated by chironomids and crustaceans and the flat depth by oligochaeta and nematodes. (Harris-Wisconsin)
W77-05223

STABILITY OF THE OXYGEN STRATIFICATION IN A EUTROPHIC LAKE,
R. Lingeman, B. J. G. Flik, and J. Ringelberg.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II,p. 1193-1201, 1975. 7 fig., 13 ref.

Descriptors: *Oxygen, *Diurnal distribution, *Stratification, *Dissolved oxygen, Lakes, Limnology, Depth, Time, Foreign research, Monitoring, Measurement, Fluctuations, Equilibrium.
Identifiers: *Barlosche Kolk(Netherlands), *Oxygen stratification, Oxygen concentration.

A two-year study of Barlosche Kolk, a eutrophic lake in the eastern Netherlands with a maximum depth of about six meters and a surface area of 3.5 hectares, focused on changes in oxygen concentration with depth and time--using 24-hour periods s the fundamental units of study in which various physical, chemical and biological data were collected. A YSI model 54 oxygen monitor, compensated for temperature and hydrostatic pressure, was used for in situ measurements. Every hour the probe was lowered from a raft to different depths between 0.25-5. 25 meters at intervals of 0.5 meters. Three conclusions were drawn from analysis of the data: (1) During late spring and early summer--the period of formation of the summer stratification--oygen stratification is highly stable with respect to external distrubances, and re-establishment occurs within serveral hours; (2) although the presence of a steep oxygen gradient usually coincides with a well-defined thermocline, the latter being the origin of a stable situation, this was not demonstrated in the present investigation; and (3) in the late summer and early autumn, the period of destruction of the summer oxygen stratification, the stratification is unstable and re-establishment takes several days when it occurs at all. (Harris-Wisconsin)
W77-05224

DYNAMIC OF NUTRIENT LIMITATIONS IN SIX SMALL LAKES,
G. Chiaudani, and M. Vighi.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1319-1324, 1975. 2 fig., 2 tab., 13 ref.

Descriptors: *Nutrients, *Algal control, *Limiting factors, *Bioassay, Analytical techniques, Chemical analysis, Regression analysis, Statistical methods, Eutrophication, Phosphorus compounds, Nitrogen compounds, Lakes, Limnology, Foreign research.
Identifiers: *Brianza Lakes(Italy), *Selenastrum capricornutum, Nitrogen/phosphorus ratio.

Laboratory bioassays of samples which utilized Selenastrum capricornutum (Prinz) as the test organism, were carried out monthly in 1972-73 on six small subalpine lakes (the Brianza Lakes) in northern Italy near the southern part of Lake Como. The bioassays were aimed at establishing experimentally which of the essential mineral elements must be removed to restrain or cut down excessive algal growth in lake waters. Measurements were made of orthophosphate phosphorus, total soluble phosphorus, ammonia nitrogen, total inorganic carbon (computed from total alkalinity, acidity and temperature) and three measured nitrogen oxidation forms. Morphological characteristics were examined in the lakes, and a stepwise multiple regression analysis was run to evaluate the statistical relationship between S. capricornutum growth as a dependent variable and different chemical parameters as independent variables. Three conclusions were drawn from this analysis: (1) The molybdenum blue method, as confirmed by biological assays, measures the phosphorus available for algal growth; (2) orthophosphate phosphorus appears to be the key factor for phytoplankton growth in all six lakes, followed by nitrogen as the factor of second-ranked importance and as verified by the stepwise multiple regression analysis; (3) the evaluation of the nitrogen/phosphorus ratio in lake waters during winter overturn can reasonably permit forecasts of the dynamics of nutrient limitation all through the year. (Harris-Wisconsin).
W77-05225

CHARACTERISTICS OF ALGOFLORA OF DIFFERENT SECTIONS OF THE TETEREV RIVER, (IN UKRANIAN),
Kharkov State Univ. (USSR). Dept. of Lower Plants.
T. V. Dohadina.
Ukr Bot Zh 32(1), p 19-23, 1975.

Descriptors: *Algae, *Cyanophyta, Chlorophyta, Chrysophyta, Euglenophyta, Pyrrophyta, Rivers, Xanthophyta, Water pollution effects.
Identifiers: Bacillariophyta, Chlorococcophycaceae, *Teterev River(USSR), Ukarainan-Ssr, USSR, Volvocophycaceae.

The Teterev river above Zhitomir (Ukarianian SSR, USSR) is characterized by algoflora typical for small rivers in Polesye; some parts of the river are oligosaprobic and others, B-mesosaprobic. A total of 323 spp. were found including 386 varieties and forms of the divisions; Chyrsophyta, Pyrrophyta, Euglenophyta, Chlorophyta, Xanthopyta, Bacillariophyta and Cyanophyta. Polluted water below the city was characterized by an increase in Chlorococcophycaceae, Euglenophyta and Volvocophycaceae and a decrease in diatoms. An insignificant amount of blue-green algae was also found. A total of 192 spp. were common to polluted and unpolluted water. A study of the water of urban purification plants showed that it contained 42 spp. not found in the unpolluted water but isolated from the water below the city. Data on the chemical composition of water from the Teterev river are also given.--Copyright 1976, Biological Abstracts, Inc.
W77-05226

BACTERIAL DISTRIBUTIONS IN LAKE ERIE (1967, 1970),
Canada Centre for Inland Waters, Burlington (Ontario).
S. S. Rao, and B. K. Burnison.
Journal Fisheries Research Board of Canada, Vol. 33, p. 574-580, 1976. 9 fig., 18 ref.

Descriptors: *Lake Erie, *Bacteria, *Distribution, *Coliforms, Aerobic bacteria, Mapping, Great Lakes, Path of pollutants.
Identifiers: Heterotrophic bacteria, Membrane filtration counts.

Standard plate counts and membrane filtration counts were the procedures used to determine densities of aerobic heterotrophic bacteria and coliforms in Lake Erie in 1967 and 1970 as the basis for mapping bacteria density and distribution. Epilimnetic aerobic heterotrophs were mapped by number/ml for June 2-9, Augus 21-31, October 23-30 of 1967 and for May 6-10, August 25-30 and November 25-30, 1970 and hypolimnetic densities for August 25-30, 1970. Coliforms were mapped by number/100 ml, for the epilimnion in July 28-August 2, and the hypolimnion for July 28-August 2, 1970. Concentrations of coliforms and aerobic heterotrophs were highest in the western basin and nearshore areas. In particular, areas near the Detroit River, Grand River (Ontario), and Cuyahoga River (Cleveland, Ohio) showed high counts as did the area near Erie, Pennsylvania. (Auen-Wisconsin)
W77-05227

NITROGEN AND PHOSPHORUS UTILIZATION BY SPARTINA ALTERNIFLORA IN A SALT MARSH IN BARATARIA BAY, LOUISIANA,
Louisiana State Univ., Baton Rouge. Lab. of Flooded Soils and Sediments.
W. H. Patrick, and R. D. Delaune.
Estuarine and Coastal Marine Science, Vol. 4, No. 1, p. 59-64, 1976. 2 fig., 2 tab., 11 ref. NOAA SG-2-35231.

Descriptors: *Marsh plants, *Productivity, *Nitrogen, *Phosphorus, *Absorption, Salt marshes, *Louisiana, Nutrients.
Identifiers: Cord grass, *Spartina alterniflora, *Barataria Bay(La).

To determine if nitrogen and phosphorus become limiting in a coastal marsh, field experiments were conducted in which inorganic nitrogen and phosphorus were added to dense stands of S. alterniflora to determine yield and uptake of these nutrients. Added nitrogen increased both productivity and plant nitrogen content. The first sampling indicated that nitrogen content was 1.4% in the fertilized plots compared to 0.9% in the untreated plots, consequently increasing the nutritional value of the cord grass considerably, and also improving the quality and quantity of the grass. None of the fertilizer was available to the crop the following spring even though only 29% of the added nitrogen had been removed by the plant material the previous fall. Experiments with nitrogen mineralization showed that the marsh soil was capable of supplying approximately 12 micrograms nitrogen per g of soil (dry weight) per week, or that for a 50 cm depth of sediment 17 kg/ha of nitrogen per week was released; however that was insufficient for maximum yield. The addition of

phosphate had no effect on productivity as the sediment contained a sufficient amount of phosphorus for plant growth. (Auen-Wisconsin).
W77-05228

THE FISH COMMUNITY IN LAKE ERIE,
Lake Erie Fisheries Research Station, Wheatley (Ontario).
J. H. Leach, and S. J. Nepszy.
Journal Fisheries Board of Canada, Vol. 33, p. 622-638, 1976. 8 fig., 2 tab., 57 ref.

Descriptors: *Fish populations, *Lake Erie, *Commercial fish, Fish parasites, Water pollution effects, Fisheries, Great Lakes.

Lake Erie has 114 species of 24 families of fish and is dominated by mesothermal and warmwater species. Although commercial fish production has been fairly consistent (average annual yield of 23,000 metric tons since 1915) there has been a dramatic change in species composition. Lake sturgeon, lake trout, lake herring, lake whitefish, sauger, and blue pike have virtually disappeared. Commercial production of medium-priced species such as yellow perch and white bass has increased and lower-valued species such as rainbow smelt, alewife, and freshwater drum have become more dominant in the fishery. The anthropogenic stresses deemed largely responsible for these changes are, in approximate order of effect, an intensive commercial fishery, nutrient loading, the introduction of exotic species, tributary and shoreline restructuring, erosion and siltation, and introduction of toxic materials. The effects of these stresses on the lake environment and species composition is discussed. Efforts to improve water quality and to control and reduce nutrient loading should lead to an improvement in the near future. Lake Erie is well suited for the production of valuable period species but unless a strong effort is made to regulate exploitation the future of the commercial fishery is precarious. Restoration of water quality levels conducive to salmonid production may be an unrealistic goal. (Auen-Wisconsin)
W77-05229

ULTRASTRUCTURAL LOCALIZATION OF LEAD IN STIGEOCLONIUM TENUE (CHLOROPHYCEA, ULOTRICHALES) AS DEMONSTRATED BY CYTOCHEMICAL AND X-RAY MICROANALYSIS,
Canada Centre For Inland Waters, Burlington (Ontario).
B. A. Silverberg.
Phycologia, Vol. 14, p. 265-274, 1975. 12 fig., 1 tab., 32 ref.

Descriptors: *Chlorophyta, *Lead, *Cytological studies, *Resistance, Absorption, Algae, Adaptation, Heavy metals, Toxins, Water pollution sources.
Identifiers: Stigeoclonium tenue, Lead detoxification, *Metal ions.

The ability of some alga to tolerate high levels of metal ions suggests that specially-developed biological mechanisms remove excess metal ions so as not to affect the general metabolism or damage the sensitive cell membranes and organelles. Results of studies, including TEM-X-ray microanalysis of Stigeoclonium tenue experimentally exposed to increasing concentrations of lead nitrate, demonstrate that metal tolerance exhibited by this algae results from partial exclusion of the metal ions by the cell wall. A fine-structural examination of the cells revealed that detectable amounts of lead had entered the cytoplasm and could be recognized most easily as electrondense precipitates localized on the cell wall and within the two large peripheral vacuoles. Dense deposits were never observed in mitochondria, plastids or nuclei. Pinocytotic vacuoles containing lead sphreroids are removed endocytotically to the cytoplasmic vacuoles, rendering the lead innocuous. The evidence suggests that the cell wall and vacuoles are important structures in maintaining relatively low cytoplasmic lead concentrations, thereby reducing the toxic effects of lead ions on sensitive cellular functions. At concentrations ranging from 0.15 to 0.5 mg Pb/l, noticeable alterations in the fine structure of the chloroplast were evident. A method is described for the visualization of lead deposits in fresh, chemically-fixed and plastic-embedded material using a saturated solution of sodium rhodizonate. (Auen-Wisconsin)
W77-05230

SEDIMENT STUDY, LAKE GEORGE, NEW YORK: TRACE METALS (FE, MN, CU, CR, ZN) ORGANIC CARBON, MAN'S ACTIVITIES,
Giessen Univ. (West Germany). Dept. of Geology.
M. Schoettle, and G. M. Friedman.
Rensselaer Polytechnic Institute Report FWI 74-4, 1976. 10 p. 6 fig., 1 tab., 14 ref. (Extract from the publications of the 9th International Congress of Sedimentology, Nice 1975, p. 119-124).

Descriptors: *Lake sediments, *Metals, Iron, Manganese, Copper, Chromium, Zinc, Carbon, Clays, Organic matter, *New York, Human population, Social aspects, Lakes.
Identifiers: *Lake George(NY).

Effects of man's activities in stirring up accumulated iron, manganese, dopper, chromium and zinc in the bottom sediments of Lake George (New York) was measured by comparing the southern mesotrophic lake basin, which is subject to pollution from a higher population density, to the northern oligotrophic basin containing a sparse or negligible population. Both cores were taken in deep trenches which had shown traces of element enrichment in the surface sediments. The core from the northern basin penetrated the entire thickness of modern organically rich sediment and terminated in relict glacial clays; the southern basin core did not reach the glacial sediments, reflecting the higher sedimentation rate in the southern basin. Concentrations of iron, copper, chromium and zinc were almost constant throughout the northern basin core despite increasing amounts of organic carbon whereas in the southern basin all trace metals were concentrated near the top of the core. The inference is that man's activities in the southern basin watershed are responsible for the metals enrichment. Enrichment does not depend on the amounts of organic carbon. The total enriched contents of the southern and northern basin cores were, respectively, 10.8 and 9.8 for iron, 0.21 and 0.33 manganese, 79 and 70 for copper, 67 and 88 chromium and 400 and 250 zinc in ppm. (Auen-Wisconsin)
W77-05231

THE DISTRIBUTION AND RELATION OF PARTICULATE ORGANIC MATERIAL AND PRIMARY PRODUCTIVITY IN THE GEORGIA BIGHT, 1973-1974,
Georgia Univ., Sapelo Island. Marine Inst.
E. B. Haines, and W. M. Dunstan.
Estuarine and Coastal Marine Science, Vol. 3, No. 4, p. 431-441, 1975. 3 fig., 3 tab., 34 ref. NSF GA-28742, GA-33261.

Descriptors: *Organic matter, *Primary productivity, *Continental shelf, *Georgia, Atlantic Ocean, Chlorophyll, Carbon, Nitrogen, Shallow water, Deep water, Southeast U.S., Seasonal, *Distribution.
Identifiers: *Georgia Bight(Atlantic Ocean).

The distribution and relation of particulate organic carbon, particulate nitrogen, Chlorophyll-a and primary productivity in the continental shelf waters off the Georgia coast was that chlorophyll-a concentrations were generally greater than 0.5 mg cu m in water shallower than 20 m between 0.1 and 0.5 mg cu m in deeper waters. Annual phytoplankton productivity estimated from seasonal data was 285 g of C/sq m/yr for waters of 0 to 20 m depth, 132 g of C/sq m/yr for waters of 20 to 200 m depth, and an average of 171 g of C/sq m/yr for the entire shelf. High chlorophyll-a concentrations and primary production rates suggested a shelf-wide bloom in December. Ratios of carbon to nitrogen and carbon to chlorophyll-a, together with carbon isotopic ratios, indicated that the most nearshore particulate organic material originated from in situ phytoplankton production rather than from the discharge of detritus from adjacent carbon-rich estuaries. Distributions of organic carbon and particulate nitrogen were fairly constant with time in the Bight; however chlorophyll-a and primary production rates varied greatly by month and showed no constant relationship to concentrations of particulate organic carbon. (Auen-Wisconsin)
W77-05232

SEASONAL DISTRIBUTION AND ABUNDANCE OF CRUSTACEAN ZOOPLANKTON IN LAKE ERIE, 1970.
Canada Centre for Inland Waters, Burlington (Ontario).
N. H. F. Watson.
Journal Fisheries Research Board of Canada, Vol. 33, p. 612-621, 1976. 7 fig., 19 ref.

Descriptors: *Zooplankton, *Crustaceans, *Invertebrates, *Distribution, *Lake Erie, Seasonal, Varieties, Copepods, Mapping, Daphnia, Dominant organisms, Great Lakes.
Identifiers: Cyclopoids, Cladocerans, Calanoids, Bosminids, Diacyclops bicuspidatus thomasi.

In Lake Erie over much of 1970, cyclopoids dominated by Diacyclops bicuspidatus thomasi were most numerous with offshore centers of abundance. Several species of cladocerans, often with short peaks of occurrence, were most abundant during summer in the western basin and were associated with south shore population centers in the central basin. Calanoids were frequently much less abundant than either of the two groups but inhabited the same areas as the cladocerans. Most species were short-lived but contained a high reproductive potential. For some species, especially among the cyclopoids, a seasonal pattern related to life-history events could be discerned. Abundance of the cladocerans and warmwater calapoids with short generation times could be regarded as responses to environmental stimuli, especially temperature and detrital food sources. Several life-cycle patterns were evident including species with spring-fall maxima and those with a single peak. Timing of peak abundance of certain species and groups varied from west to east in the same fashion as temperature differences, giving rise to east-west abundance gradients which changed with season. Cladoceran and calanoid groups showed similarities in distribution pattern related to particulate organic material rather than algal abundance, resulting north-south gradients. (Auen-Wisconsin)
W77-05233

RELATIONSHIPS OF PHYTOPLANKTON BIOMASS WITH SOLUBLE NUTRIENTS, PRIMARY PRODUCTION, AND CHLOROPHYLL A IN LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
M. Munawar, and N. M. Burns.
Journal Fisheries Board of Canada, Vol. 13, p. 601-611, 1976. 4 fig., 7 tab., 13 ref.

Descriptors: *Phytoplankton, *Primary productivity, *Nutrients, *Chlorophyll, *Lake Erie, Biomass, Distribution patterns, Phosphorus, Nitrogen, Nitrates, Nitrites, Ammonia, Statistical methods, Great Lakes.
Identifiers: Factor analysis.

Comparison of the annual distribution patterns of phytoplankton biomass, chlorophyll-a, primary production, soluble reactive phosphorus, nitrate +

nitrite, and ammonia concentrations revealed that these six variables had very similar distributions in Lake Erie during 1970. However, statistical analysis of the data only revealed a few consistent relationships between these variables. Phytoplankton biomass was correlated with chlorophyll-a only in the summer and fall, as was primary production with chlorophyll-a and biomass; there was no correlation between these three variables during the spring. Also, there was no consistent relationship between biomass and soluble nutrients. The primary production and activity coefficient (mg C assimilated/mg phytoplankton biomass/day) were found to be unrelated to temperature. Factor analysis showed that in the spring, primary production correlated with the soluble phosphorus and nitrogen only, whereas during summer, primary production correlated with biomass, chlorophyll-a, the major plankton groups (Cyanophyta, Chlorophyta, Chrysomonadinae, and Diatomeae), and the phosphorus nutrients. In the fall, production was positively correlated with phytoplankton biomass and with the Chlorophyta in particular. The use of chlorophyll-a and temperature as variables in the equation to estimate phytoplankton growth was found to be questionable. (Auen-Wisconsin).
W77-05235

LOCAL AND SEASONAL VARIATIONS IN POPULATIONS OF THE LEECH ERPOBDELLA OCTOCULATA (L) IN A POLLUTED RIVER WARMED BY CONDENSER EFFLUENTS,
Central Electricity Generating Board, Ratcliffe-on-Soar (England). Freshwater Biology Unit.
R. J. Aston, and D. J. A. Brown.
Hydrobiologia, Vol. 47, No. 2-3, p. 347-366, 1975. 8 fig., 3 tab., 11 ref.

Descriptors: *Water pollution effects, *Life cycles, Annelids, *Thermal pollution, Sewage effluents, Reproduction, Foreign countries, Heated water, Tubificids, Food chains, *Seasonal, *Variability.
Identifiers: *Leeches, *Erpobdella octoculata, *River Trent(Great Britain).

Variations in life cycles and local differences in weight are described for the leech E. octoculata, taken from the River trent (Great Britain) and subjected to different levels of pollution--mainly domestic sewage--and to heated water from local power stations. The mean weight of the leeches increased in the sewage-polluted leaches; this increase could have been produced by a greater abundance of tubificid worms generally found in heavily polluted waters, which would have provided a good food supply for the leeches. Young leeches emergine up to a month earlier at some sampling points was probably due to separate and/or combined effects of increased temperatures by power station effluents and by the more rapid growth, earlier maturity and larger size of the leeches at the upstream sewage-polluted reach. The life cycle was completed in about a year but there was circumstantial evidence to suggest that the life cycles were extended to two years at the least polluted sampling points. In spite of variations of up to a month in the timing of sexual maturation, cocoon laying and emergence of newly-hatched leeches, the basic seasonal pattern of reproduction and growth was similar at all sampling points. (Auen-Wisconsin)
W77-05236

EVALUATING WATER QUALITY IMPACTS OF SMALL STREAMS ON MAJOR URBAN RIVERS,
Hydroscience, Inc., Westwood, N.J.
M. J. Small, and W. P. Darby.
Journal of the Boston Society of Civil Engineers Section, American Society of Civil Engineers, Vol. 63, No. 2, p 101-122, July 1976. 11 fig, 3 tab, 11 ref.

Descriptors: *Water quality, Effects, *Streams, *Evaluation, *Rivers, Urban hydrology, Methodology, Biochemical oxygen demand, Dissolved oxygen, Runoff, Watersheds(Basins), Streamflow, Oxygen sag, Simulation analysis, Mathematical models, Systems analysis.
Identifiers: Frequency distribution.

Application of the 1972 Federal Water Pollution Control Act Amendments to small urban streams presents complex managerial problems due to the dual role which these streams play in an urban water resources system. Each stream could provide a limited, yet valuable, set of intrinsic beneficial uses. Both collectively and individually, small streams influence the water quality of larger urban rivers. Before the intrinsic water quality demands of a small stream are evaluated, water quality goals to protect major river quality must be established. Within any reach of a major river, differences in upstream and downstream water quality can be attributed to: (1) the tributary streams which enter the major river within the reach; and (2) effluents which enter the river directly. The analysis herein determines what portion of major river degradation is due to the water quality conditions of the small streams. Discussed is the Environmental Protection Agency's steady-state oxygen sag model for the Pittsburg area. The methodology presented herein is illustrated with a case study of the region of Allegheny County, Pennsylvania and concludes that for this region, little improvement in major river quality can be expected from upgrading the water quality of small streams. (Bell-Cornell)
W77-05249

WATER-QUALITY CHARACTERISTICS OF SIX SMALL LAKES IN MISSOURI,
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-05259

UPPER JAMES RIVER BASIN WATER QUALITY MANAGEMENT PLAN.
Wiley and Wilson, Inc., Lynchburg, Va.
For primary bibliographic entry see Field 5G.
W77-05294

CHARACTERISTICS OF THE PELAGIC ENVIRONMENT OF THE BRACKISH-WATER LAGOONS OF BAGES-SIGEAN AND SALSES-LEUCATE DURING THE SUMMER OF 1974, (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
G. Jacques, G. Cahet, M. Fiala, J. Neveux, and M. Panouse.
Vie Milieu Ser A Biol Mar 25(1), p 1-18, 1975.

Descriptors: *Brackish water, *Salinity, Chlorophyll, Environment, Lagoons, Microorganisms, Productivity, Water pollution effects, *Phytoplankton, Nitrogen, Phosphorus, Diatoms.
Identifiers: Chaetoceros-compressus, Chaetoceros-costatus, Chaetoceros-socialis, Coscinodiscus-granii, Cryptophyceae, Euglenoid, *France, Gymnodinium-nelsoni, Leptocylindrus-minimus, Nitzschia-closterium, Nitzschia-delicatissima, *Pelagic environment, Peridinium-nudum, Prorocentrum-micans.

The brackish water lagoons of Bages-Sigean and Salses-Leucate (France) are influenced by similar climate conditions of the Mediterranean type; strong isolation, heavy and irregular rains and strong NW winds. The 2 lagoons have a very different haline regime. In the Bages-Sigean lagoon, salinity decreases from S to N. In Salses-Leucate the salinities in summer are almost equal to marine salinities. The waters of Bages-Sigean are rich in nutrients, mainly P-PO4. The N/P ratio varies between 1-4.5. The waters of Salses-Leucate are less rich in nutrients, especially P-PO4, because of a more marked marine influence: the N/P ratio is between 3-11. The O2 content of the lagoons is high and the saturation never drops below 75%. The high mineral element level allows considerable development of phytoplankton. North of Bages-Sigean, the chlorophyll content exceeds 12 mg.m-3. At stations under marine influence, the amount of chlorophyll varies between 0.4 and 0.3 mg.m-3. The composition of the phytoplankton of the 2 lagoons is very similar. The microphytoplankton is composed of diatoms and dinoflagellates. Among the dominant ones are the diatoms: Chaetoceros socialis, C. compressus, C. costatus, Cosinodiscus granii, Leptocylindrus minimus, Nitzschia closterium, N. delicatissima and the peridinans Prorocentrum micans, Peridinium nudum and Gymnodinium nelsoni. The nanoplankton is mainly represented by euglenoids and Cryptophycease. The activity of chemolithotrophic and chemo-organotrophic micro-organisms is high in the less productive lagoon of Salses-Leucate.
W77-05304

THE ROLE OF ZOOPLANKTON IN THE INTRABIOCOENOTIC PHOSPHORUS CYCLE AND FACTORS AFFECTING PHOSPHORUS EXCRETION IN A LAKE,
New Hampshire Univ., Durham. Dept. of Zoology.
J. G. Ferrante.
Hydrobiologia, Vol. 49, No. 3, p. 203 - 214, 1976. 10 fig, 7 tab, 7 ref. OWRT A-029-NH(4). 14-31-0001-3229.

Descriptors: Zooplankton, *Phosphorus, Seston, *Cycling nutrients, Lakes, Ponds, *New Hampshire, Absorption.
Identifiers: *Zooplankton excretion(Phosphorus), Seston utilization, Stonehouse Pond(NH).

The temporal and spatial excretion rates of specific size groups of limnetic zooplankton were studied by measuring changes in soluble reactive phosphorus following incubation. Animals were collectd in the epilimnion and hypolimnion of Stonehouse Pond, New Hampshire from August, 1972, to July, 1973 and separated into > 0.308 and < 0.308 (mm) size groups. Temporal excretion rates varied considerably within groups, however, similar patterns were observed in both strata. Peak excretion rates were observed in the spring and fall with a low in winter months. In addition, smaller animals excreted at higher rates and excretion rates of both size groups in the epilimnion exceeded those in the hypolimnion. The phosphorus uptake of natural seston relative to the amount released by zooplankton is considered using mass balance equations and kinetic analyses. During the spring of 1973 excretion rates increased, however, this increase was offset by an even greater rise in the rate of phosphorus uptake by the seston. This suggests that during this period the phosphorus excretions of zooplankton were not sufficient to meet the amount of phosphorus being removed by the seston.
W77-05312

THE CHARACTERIZATION OF PHOSPHORUS EXCRETION PRODUCTS OF A NATURAL POPULATION OF LIMNETIC ZOOPLANKTON,
New Hampshire Univ., Durham. Dept. of Zoology.
J. G. Ferrante.
Hydrobiologia, Vol. 50, No. 1, p. 11-15, 1976. 2 fig, 1 tab, 23 ref. OWRT A-029-NH(3). 14-31-0001-3229.

Descriptors: Zooplankton, Inorganic compounds, Seston, *Phosphorus, *New Hampshire, Ponds, Spectroscopy, Pollutant identification, Lakes.
Identifiers: *Zooplankton excretion(Phosphorus), Stonehouse Pond(NH).

The characteristics of phosphorus excretions of zooplankton collected in spring 1974 from Stonehouse Pond, New Hampshire were studied

with gel filtration, ultraviolet spectroscopy and seston incorporation. The soluble phosphours component released from a natural population has a molecular weight the same as orthophosphate and behaves similar to orthophosphate in seston incorporation studies. Approximately 15 percent of the total phosphorus released was organic, but could not be identified by ultraviolet spectroscopy. No evidence of nucleic acid excretion of any hydrolytic degradation product was detected in the ultraviolet spectrum.
W77-05313

ALGAL COMPETITION IN AN EPILITHIC RIVER FLORA,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. L. Klotz, J. R. Cain, and F. R. Trainor.
Journal of Phycology, Vol. 12, No. 4, p. 363-368, 197[illegible] 2 fig, 2 tab, 30 ref. OWRT A-052-CONN(15). 14-31-0001-3507.

Descriptors: *Bioassay, *Algae, *Competition, *Chlorella, Effluents, *Sewage treatment, Treatment facilities, Waste water treatment, Connecticut, Water pollution effects, Pollutant identification.
Identifiers: *Algal assay, *Algal competition, *Achnanthes, *Epilithic algae, *Pollution index, *Pollution zones, Substrate, Shetucket River(Conn).

Field and laboratory procedures demonstrate that the effluent from the Willimantic, Connecticut, sewage treatment plant changes the numerical composition of the dominant epilithic algae in the Shetucket River. This effect is due to the effluent altering the competitive balance between Chlorella sp. and Achnanthes deflexa Reim. The Chlorella completely dominates highly polluted stretches of the river, and shares dominance with A. deflexa in other areas. The degree of river pollution can be estimated by enumerating the natural standing crops of these 2 algae. A 2-membered assay utilizing these organisms is a sensitive laboratory pollution monitor and a useful predictive tool. Dominant stands of these epilithic species develop in polluted and unpolluted zones in this river due to competition for the limited area on the cobbles. (de Lara-Conn)
W77-05314

LANGUAGE FOR MODELING HYDROBIOLOGICAL PROCESSES, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
For primary bibliographic entry see Field 5B.
W77-05329

YBBARPSAN-A SMALL RECEPTACLE FOR A LARGE INDUSTRY: LIMNOLOGICAL STUDY OF THE YBBARPSAN RIVER, (IN SWEDISH),
Lund Univ. (Sweden). Limnological Inst.
B. Berzins, and I. Lundqvist.
Vatten. 29(4), p 429-443, 1973.

Descriptors: *Limnology, Rivers, Ecology, Periphyton, Biochemical oxygen demand, Chemical oxygen demand, *Eutrophication, Industrial wastes, Waste water treatment.
Identifiers: *Ybbarpsan River(Sweden).

The limnology of the Ybbarpsan River (Sweden) was studied during 1971-1972. Perstorp AB, a firm manufacturing chemicals and plastics, used the river as a receiving body for waste water until the factory began treating its effluents in 1971. Information about the physical, chemical and biological changes after the effluent treatment started is presented. changes in COD (chemical oxygen demand) KMnO4-oxidation) and BOD7 (biological oxygen demand), in dissolved oxygen and in ionic constituents were studied. A semiquantitative method to evaluate the periphyton population was developed. changes in the 4 ecological groups (saprobic, oligotrophic, eutrophic and indifferent organisms) were estimated and are shown. The total semiquantitative change (all ecological groups together) in 1971-1972 is shown. Most of the saprobic organisms were replaced by eutrophic and indifferent organisms. Downstream from the treatment plant the improvement was about 10-25%.--Copyright 1975, Biological Abstracts, Inc.
W77-05339

A CHEMICAL INVESTIGATION OF PHOSPHORUS REMOVAL IN LAKES BY ALUMINUM HYDROXIDE,
Wisconsin Univ.-Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5G.
W77-05367

ENVIRONMENTAL ASSESSMENT,
Delaware Univ., Lewes. Coll. of Marine Studies.
For primary bibliographic entry see Field 6G.
W77-05381

MARINE POLLUTION RESEARCH TITLES.
Marine Biological Association of the United Kingdom, Plymouth (England). Marine Pollution Information Centre.
For primary bibliographic entry see Field 5A.
W77-05383

EFFECTS OF DREDGING AND DISPOSAL ON SOME BENTHOS AT MONTEREY BAY, CALIFORNIA,
Moss Landing Marine Labs., Calif.
J. S. Oliver, and P. N. Slattery.
Army Coastal Engineering Research Center, Ft. Belvoir, VA., Technical Paper No. TP-76-15, October 1976. 81 p, 15 fig, 10 tab, 97 ref, 2 append. DACW72-73-C-0010.

Descriptors: *Baseline studies, *Dredging, *Waste disposal, *Environmental effects, Resources development, *Water pollution effects, *California, Benthos, Sedimentation, Harbors.
Identifiers: *Outer Continental Shelf, *Monterey Bay(Calif).

The effects of dredging and disposal on some benthos are documented. The natural benthic assemblages differed with changes in the amount of sediment movement or substrate stability. Many animals characterized the relatively stable submarine ridges but few inhabited the unstable terrace slopes of the submarine canyon in Monterey Bay, California. Dredging in the channel areas removed 60% of the original population of bottom animals. After 1.5 years, the number of individuals was low but the species diversity and evenness indexes were higher than before dredging. Disposal of dredged material near the Monterey Canyon head at Moss Landing, California, removed 60% of the individuals. Organisms adapted to unstable bottom conditions survive burial better than others. The ultimate recovery of a disturbed area depends upon the timing of the action in relation to the reproductive cycles and distributive abilities of the benthic organisms in the area. In Monterey Bay, spring and fall are the most active spawning seasons and dredging or dumping should be avoided during these seasons. Underwater disposal of dredged material should be made in unstable bottom areas if possible. (Sinha-OEIS)
W77-05387

THE LAKE OF STARNBERG AND THE MANAGEMENT OF ITS COREGONID POPULATION WITH RESPECT TO ITS TROPHIC STATE, (IN GERMAN),
Bayerische Landesanstalt fuer Fischerei, Starnberg (West Germany).
A. Koelbing.
Veroeff Zool Staatssamml Muench. 17(1-103), p 1-108a, 1974.

Descriptors: *Oxygen, *Phosphates, *Lakes, *Trophic level, Water pollution effects.
Identifiers: *Coregonids, Coregonus-acronius, Coregonus-fera, Coregonus-macrophthalmus, Coregonus-wartmanni, Ergasilus-sieboldii, Protocephalus-longicollis, Triaenophorus-crassus, *West Germany(Lake of Starnberg).

Studies from Dec. 1970-May 1972 showed that the metalimnic minimum was 6.3 mg O2/l at 16 m depth, the lowest O2 value recorded was 1.7-2.0 mg O2/l in Nov. 1971 and O2 saturation was 87% in April 1971 and 78% in May 1972 before the start of the summer stagnation period. The phosphate level has increased significantly since 1960. Coregonus wartmanni, C. macrophthalmus, C. fera and C. acronius were studied; 1% of the population consisted of damaged specimens. Few Ergasilus sieboldii and Protocephalus longicollis larvae and adults were found and there were no Triaenophorus crassus. Spawning began in the 1st 1/2 of Dec. It was conditionally dependent on a water temperature of 7C and occurred in shoreline and open water zones. The sex ratio was 1:1, 100,000 eggs/l were counted and hatching extended from 231-386 days. Fishery yield varied between 0.87 kg/ha in 1927-12.72 kg/ha in 1966. The average corpulence factor was 0.85 and 3 yr old slow-growing specimens weighed only 1/2 as much as fast-growing specimens of the same age. These data were compared with those collected at other German lakes.--Copyright 1975, Biological Abstracts, Inc.
W77-05414

SUMMARY REPORT, NITROGEN SUPERSATURATION IN THE COLUMBIA AND SNAKE RIVERS,
Environmental Protection Agency, Seattle, Wash.
Technical Report No. TS-09-70-208-016, July 1971. 11 p, 1 fig.

Descriptors: Salmon, Rainbow trout, *Columbia River, *Supersaturation, Dissolved oxygen, Nitrogen, *Mortality, *Fish migration, Juvenile fish, Anadromous fish, *Hydroelectric plants, Chinook salmon, Dams, Dam sites, *Spillway.
Identifiers: *Gas bubble disease, Steelhead trout, *Snake River, *Nitrogen supersaturation, Flow reduction program.

Future of salmon and steelhead in the Columbia and Snake Rivers is seriously jeopardized by high levels of nitrogen supersaturation during spring fish migration periods. Toxic concentrations of dissolved nitrogen persist from most upstream dams to the mouth of the Columbia River during periods of spill. High nitrogen contents are caused at the mainstream hydroelectric dams when river flow is passed over the spring flood period. (Katz)
W77-05415

EXPLORATORY STUDIES OF THE INTERACTIONS OF GAS SUPERSATURATION AND TEMPERATURE ON MORTALITY OF JUVENILE SALMONIDS,
Battelle-Pacific Northwest Labs., Richland, Wash.
C. C. Coutant.
September 28, 1970. 23 p. 1 tab., 5 fig, 9 ref.

Descriptors: Salmon, *Fish passages, *Juvenile fish, Anadromous fish, Columbia River, Bioassay, *Mortality, Warm water, Water temperature, *Supersaturation, Nitrogen, Chinook salmon, Fish diseases, Water pollution effects, Methodology.
Identifiers: *Juvenile chinook salmon, Thermal plume, Hanford works.

Experiments were conducted to determine the levels of gas supersaturation and temperature change required to produce identifiable synergistic effects on mortality of juvenile salmonids. A specific question was the effect of passage through the Hanford thermal plumes. Mortality would require about 6 hours of residence in the warmed waters. (Katz)

W77-05416

SUPERSATURATION...CRISIS ON THE COLUMBIA AND SNAKE RIVERS,
Environmental Protection Agency, Seattle, Wash.
EPA Newsletter No. 2, July, 1972, p. 1-4.

Descriptors: *Fish diseases, Water quality, Water pollution effects, *Columbia River, Salmon, Rainbow trout, *Supersaturation, Mortality, *Nitrogen, Dissolved oxygen, *Dams, Dam sites, Spillways, *Lethal limit.
Identifiers: *Water quality, stanards, *Gas Bubble disease, Nitrogen supersaturation, *Snake River.

Most migrating salmon and steelhead can accommodate to supersaturation levels up to 105 percent. At levels of about 110 percent symptoms begin to show up. At 120 percent or higher lethal effects are documented. Supersaturation at this level will kill most species of fish found in the Columbia and Snake Rivers. (Katz).
W77-05417

THE WEISS SATUROMETER; MAGIC BOX SOLVES GAS MEASUREMENT PUZZLE,
Agency, Seattle, Wash.
For primary bibliographic entry see Field 5A.
W77-05418

A SUMMARY OF THE 1969 AND 1970 OUTMIGRATION OF JUVENILE CHINOOK SALMON AND STEELHEAD TROUT FROM THE SNAKE RIVER,
National Marine Fisheries Service, Seattle, Wash. Biological Lab.
H. L. Raymond.
October 1970, 19 p., 2 tab., 4 fig.

Descriptors: Salmon, *Rainbow trout, Dams, Dam sites, *Fish migration, Juvenile fish, *Anadromous fish, *Mortality, *Fish passage, Supersaturation, Fish behavior, Fish populations, Chinook salmon, On-site investigations, Fish hatchery.
Identifiers: Snake River, Little Goose Dams, Lower Monumental Dams, *Steelhead trout, Chinook smolts, *Nitrogen supersaturation, *Fish survival, Outmigration, *Outmigration delay.

Recently completed Little Goose and Lower Monumental Dams in the Snake River have seriously impaired the 1970 outmigration of juvenile chinook salmon and steelhead trout. A delay of 10 days was observed. The survival of smolts declined abruptly. The survival of smolts after completion of the two new dams was 30%. High mortalities were presumed to be due to nitrogen supersaturation on the Snake River. (Ktaz)
W77-05419

ETHANOLAMINE TOXICITY IN AQUATIC INVERTEBRATES (IN ROMANIAN),
Institutul de Medicina si Farmacie, Iasi (Rumania).
S. Apostol.
Stud Cercet Biol 27(4), p 345-351, 1975.

Descriptors: *Toxicity, *Protozoa, Aquatic insects, *Herbicides, Invertebrates, Industrial wastes, Larvae, Daphnia, Nematodes.
Identifiers: Aedes-sp, Amoeba-sp, Bodo-sp, Dephnia-magna, *Ethanolamine, Parameciumcaudatum, Planorbis-sp, Vorticella-sp.

The toxic action of the ethanolamines (used in industry and as herbicides) for aquatic invertebrates (Protozoa (Amoeba sp., Paramecium caudatum, Vorticella sp., Bodo sp), Vermes (nematodes), Gastropoda (Planorbus sp.), (Daphnia magna) and in sects (Aedes sp. larvae)) was determined. The acute action of these pollutants beginning with approximately 100 mg/l concentrations and the chronic action at <1 mg/l were recorded. Among microscopic invertebrates the most sensitive are amoeba and ciliated protozoa, and the daphnia among macroscopic invertebrates.--Copyright 1976, Biological Abstracts, Inc.
W77-05454

SUPERSATURATION OF LAKE WATER WITH A PRECAUTION TO HATCHERY USAGE,
Toronto Univ. (Ontario). Dept. of Zoology.
H. H. Harvey.
Transactions of the American Fisheries Society, Vol. 96(1967), p. 194-201, 6 fig., 20 ref.

Descriptors: Water temperature, *Dissolved oxygen, *Nitrogen, Water quality, Lakes, *Supersaturation, Thermocline, *Fish hatchery, Hydrostatic pressure, Photosynthesis, Seasonal.
Identifiers: Cultus Lake, *Oxygen supersaturation, *Nitrogen supersaturation, Fish culture, *Oxygen saturation curves, *Nitrogen saturation curves.

Water temperature and dissolved oxygen content were measured vertically in Cultus Lake on 20 occasions and dissolved nitrogen eight times during 1961. The results showed the water in the region of the thermocline became supersaturated markedly as a consequence of warming during the spring and summer. The excess gas was below the extent of surface mixing and was held in solution by the hydrostatic pressure. In mid-July at a depth of 30 feet, oxygen was 126% and nitrogen 116% of air saturation. By mid-September at a depth of 50 feet, oxygen saturation was 94% and nitrogen 110% of air saturation. Oxygen was liberated by photosynthesis in the epilimnion and upper portion of the thermocline, and consumed in the lower part of the thermocline and the upper hypolimnion. Thus nitrogen supersaturation could not be diagnosed by measurement of dissolved oxygen alone. Nitrogen supersaturation is discussed in relation to the use of lake water for hatchery culture of fish. (Katz)
W77-05455

HISTOPATHOLOGY OF GAS BUBBLE DISEASE IN SALMON FINGERLINGS,
Battelle-Pacific Northwest Labs., Richland, Wash.
G. B. Pauley, and R. E. Nakatani.
Journal of the Fisheries Research Board of Canada, Vol. 24(4), 1967, p 867-871.

Descriptors: *Fish diseases, *Animal pathology, Environmental effects, Salmon, Columbia River, Juvenile fish, Freshwater fish, Nitrogen, Supersaturation, Water pollution effects, *Fishkills, Nitrogen, *Chinook salmon.
Identifiers: *Chinook salmon fingerlings, *Gas bubble disease, Nitrogen supersaturation, Gills, Liver, Spleen, Heart, Kidney, Intestine, Stomach, Roof of the mouth, Skin, Muscle, *Pathological changes.

Chinook salmon fingerlings were diagnosed as having 'gas-bubble' disease. Gross symptoms were similar to those described by other investigators. The histopathology associated with this disease has not been previously reported. The following 10 tissues and organs were examined: gills, liver, spleen, heart, kidney, intestine, stomach, roof of the mouth, skin, and muscle. All exhibited histopathological changes with the exception of the hearts and stomachs, which did not differ from the control fish. The most striking pathological changes occurred in the roof the mouth of all fish examined. (Katz)
W77-05456

SALMON PRESPAWNING MORTALITY STUDIES AT ROCKY REACH DAM AND PRIEST RAPIDS DAM, WASHINGTON FROM SEPTEMBER TO NOVEMBER, 1965,
Battelle-Pacific Northwest Labs., Richland, Wash.
G. B. Pauley, M. P. Fujihara, and R. E. Nakatani.
For the Washington State Department of Fisheries, April 1966, 28 p., 2 tab., 12 fig., 12 ref. Contract No. 13565-8.

Descriptors: *Columbia River, *Salmon, *Mortalities, Fish kills, *Bacteria, Fungi, *Fish diseases, Adult fish, Juvenile fish, *Animal pathology, Fish hatcheries, Supersaturation, Nitrogen dams, Dam sites, *Fish parasites, *Chinook salmon.
Identifiers: *Bacterial diseases, *Fungal diseases, *Columnaris, *Dermocystidium, Histopathology, Histologic descriptors, Gas bubble disease.

A serious outbreak of adult salmon mortalities was observed among adult salmon being held in the spawning channel at Priest Rapids Dam. Tissue samples and bacterial cultures from normal and diseased fish indicated a high incidence of Columnaris disease. Gas bubble disease did not appear to be a problem among adults but was present in fingerlings held in the Rocky Reach aquaria. Histopathology studies of the gas bubble disease was made. The fish were also infested with Dermocystidium, a previously unreported fungal parasite of salmon which contributed to the mortality. (Katz)
W77-05457

FINAL REPORT ON AN EXPLORATORY STUDY OF INTERACTION OF INCREASED TEMPERATURE AND NITROGEN SUPERSATURATION OF ADULT SALMONIDS,
Battelle-Pacific Northwest Labs., Richland, Wash.
C. C. Coutant, and R. G. Genoway.
For the U.S. Bureau of Commercial Fisheries, Seattle, Washington, November 28, 1968. 28 p., 3 tab., 8 fig., 20 ref.

Descriptors: *Salmon, Adult fish, Freshwater fish, *Water temperature, Water pollution effects, *Nitrogen, *Supersaturation, Bioassay, Mortality, Fish disease, *Fish physiology, Methodology, Laboratory tests.
Identifiers: Acclimation, *Nitrogen supersaturation, 24-hr-Lethal levels, Gas acclimation, External gas bubble symptoms, *Chronic high gas saturation.

Water temperature of about 22C is lethal to adult chinook salmon within 24 hours when accompanied by nitrogen saturation values exceeding about 115%. This contrasts with a 24-hour lethal level in the literature of above 25C for temperature alone, and significantly longer survival in these experiments when temperature was acting alone. Gas acclimation condition has little practical bearing on survival at 22C under high gas saturations although accumulated chronic effects of high gas acclimation cause these fish to die somewhat faster than low gas acclimated fish. Evident distress of all fish and rapid mortality of some individuals results when fish acclimated to high gas saturations increase in temperature by about 50C while entering water of lower saturation value. External gas bubble symptoms that are evident on fish exposed to chronic high gas saturation disappear rapidly following death, nearly all being lost within 24 hours. (Katz)
W77-05458

EXPERIMENTS OF NITROGEN GAS DISEASE WITH RAINBOW TROUT FRY, (IN JAPANESE),
Freshwater Fisheries Research Lab., Nikko (Japan).
S. Shirahata.
Bulletin of the Freshwater Fisheries Laboratory, Vol. 15 (2), p. 197-211 (1966), 4 tab., 6 fig., 18 ref.

Descriptors: *Fish diseases, Rainbow trout, Freshwater fish, Animal pathology, *Fish physiology, *Fish eggs, *Fish fry, Mortality, Laboratory tests, Nitrogen, *Supersaturation, Fish hatcheries, Fish establishment, Behavior.

Identifiers: *Gas bubble disease, *Nitrogen supersaturation, *Rainbow trout fry, Japan, *Disease symptoms, *Yolk-sac fry.

Observations were made of experimentally caused gas bubble disease of rainbow trout fry. It was found that the tolerance of trout fry to the excess of nitrogen gas was high and the tolerance developed with the development of fish. Various types of symptoms were observed as the fish developed. The symptoms observed were gas bubbles adhering to the surface of fish, gas bubbles formation in circulatory systems and symptoms which combined both types of pathology. It was proved that severely affected fry could recover if transferred to water with a normal gas level. (Katz)
W77-05459

PHYSICAL AND BIOLOGICAL ASPECTS OF GAS-BUBBLE DISEASE IN IMPOUNDED ADULT CHINOOK SALMON AT MC NARY SPAWNING CHANNEL,
Washington State Dept. of Fisheries, Seattle. Hatchery Pathology Lab.
R. L. Westgard.
Transactions of the American Fisheries Society, Vol. 93, p 306-309, 1964. 2 fig., 3 ref.

Descriptors: *Columbia River, Freshwater fish, Fish disease, Nitrogen, *Supersaturation, *Adult fish, *Salmon, Water supply, Fish physiology, Fish behavior, Mortalities, *Fish kills, Reproduction, Fish hatcheries, Dams, Dam sites, Groundwater, Forebay, Spillway, Fish pathology.
Identifiers: *Spawning channel, McNary Dam, Cascading water, Plunge basin, *Gas bubble disease, *Nitrogen supersaturation, Water intake, *McNary spawning channels.

In 1962, damage to adult chinook salmon at the McNary spawning channel was serious and necessitated changes in the water supply system. The paper describes the causes, results and possible solutions for gas bubble disease in adult chinook salmon caused by nitrogen supersaturated water supplies. (Katz)
W77-05460

GAS-BUBBLE MORTALITY OF FISHES IN GALVESTON BAY, TEXAS,
Bureau of Commercial Fisheries, Galveston, Tex. Biological Lab.
W. C. Renfro.
Transactions of the American Fisheries Society, Vol. 92, 1963, p. 320-322, 1 fig., 5 ref.

Descriptors: *Fishkill, Mortality, *Supersaturation, Photosynthesis, *Fish disease, Animal pathology, Dissolved oxygen, Texas, *Phytoplankton, Fish physiology, On-site investigations, Texas.
Identifiers: *Gas bubble disease, *Oxygen supersaturation, *Gas bubbles, Galveston Bay(Tex), Houston Ship Canal, *Spotted sea trout, Largescale menhaden, Bay anchovies, Atlantic croakers, Eels, Longnose gar.

A kill of mostly spotted sea trout was observed in upper Galveston Bay. Other dead fish observed were largescale menhaden, bay anchovies, Atlantic croakers, small eels and long nose gar. Unusual features of the dead sea trout were excessive mucus in the body, bright red gills, distended swim bladders and blisters containing gas in various parts of the body. Dissolved oxygen saturation in the water reached near 250 percent saturation throughout the day. It was believed that surplus gas came out of solution in the body of the fish and obstructed circulation. (Katz)
W77-05462

THE EFFECT OF GAS CONTENT OF WATER ON LARVAL AND YOUNG FISH,
Dove Marine Lab., Cullercoats (England).
H. M. Bishal.
Zeitschrift fur Wisserschaftliche Zoologie, Vol. 163 (1960), p. 37-64, 1 fig., 107 ref.

Descriptors: Oxygen, Nitrogen, Laboratory techniques, Laboratory analysis, Methodology, Marine fish, Bioassay, *Water quality requirements, *Hydrostatic pressure, Juvenile fish, Atlantic salmon, Brown trout, Review, *Fish physiology, Demersal fish, *Supersaturation.
Identifiers: *Air bubble disease, *Gas embolism, Herring, Lump sucker, Plaice.

A review of the effect of gas content of water (oxygen and nitrogen) on fish is given. An apparatus is used which gives a continuous flow of water of a known gas content. A comparison between the method used in the present investigation and those previously known is made. Herring, lump-sucker, plaice, and salmonid larval and young stages are used. The resistance to water of low oxygen-content decreased with increase of age. This is explained as due to: mode of respiration in which exchange of gases takes place through the body wall and the blood vessels surrounding the yolk sac; carbohydrate content-which acts as a depolarizer-which decreases as the fish ages; and to the increased activity of the growing larvae. All fish used at all stages live at high oxygen concentrations (300% saturation) without any apparent ill effects provided that the total gas pressure does not exceed the hydraulic pressure. The presence of air bubbles either attached to or inside the intestine of herring larvae was not observed. In all cases the water was either saturated or nearly so but never supersaturated. Although herring larvae were kept in aerated tanks swallowing air bubbles was not observed. A brief discussion of the 'gas disease' in herring larvae is given. (Katz)
W77-05463

THE EFFECT OF PRESSURE ON THE SURVIVAL AND DISTRIBUTION OF LARVAL AND YOUNG FISH,
Khartoum Univ. (Sudan). Dept. of Zoology.
H. M. Bishai.
Journal du Conseil, Vol. 26(1961), p 292-311, 1 fig., 2 tab., 82 ref.

Descriptors: *Hydrostatic pressure, Marine fish, *Juvenile fish, *Fish eggs, Methodology, Laboratory investigations, *Fish diseases, *Animal physiology, Herrings, Atlantic salmon, Brown trout, *Mortality, Bioassays, Atmospheric gas, Reviews, Demersal fish, *Supersaturation.
Identifiers: *Sea trout, Plaice, Clupea harengus, Decompression, *Gas bubble disease.

A review of the effect of pressure on larval and young fish is given. Apparatus and methods are described to study the effects of pressure changes on young fish. Newly hatched herring larvae (Clupea harengus) could live at a pressure of 4 atmospheres. Young plaice (Pleuronectes platessa L.) are not affected by compression or decompression of at least 2 atmospheres. The effect of pressure and decompression on salmonids (Salmo salar L., Salmo trutta L, and Salmo trutta f. fario) depends on the age of the fish. Until the absorption of the yolk-sac, alevins can live under pressures as high as 5 atmospheres. They are neither affected by compression nor by decompression. The death of young salmonids due to decompression is attributed to the supersaturation of the experimental water with gas. On decompression, gas bubbles are separated from the water and attach themselves to the fish. In addition the fish may swallow gas bubbles which block their mouths and the fish die from asphyxia. Death of fish may be due to decompression sickness where gas bubbles are separated from the blood and tissues of the young fish on decompression. The ability of the blood to be supersaturated with gas under pressure may be a character of young fish with swimbladders. (Katz)
W77-05464

ORIGIN AND TREATMENT OF A SUPERSATURATED RIVER WATER,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
H. H. Harvey, and A. C. Cooper.
Progress Report No. 9, 1962, 19 p., 7 fig., 29 ref.

Descriptors: Dissolved oxygen, Nitrogen, *Supersaturation, *Water supply, Salmon, *Reviews, *Hydrostatic pressure, Fish hatchery, Water quality, Water analysis, On-site investigations, Fish disease, Solubility, *Fish physiology, Animal pathology, Juvenile fish, *Sockeye salmon, Photosynthesis, Water treatment.
Identifiers: *Oxygen-Nitrogen ratio, Abiogenic oxygen supersaturation, Biogenic oxygen supersaturation, Gas bubble disease, Sockeye alevins, Sockeye fry.

A small stream, Corbold Creek, has been investigated as to the cause of supersaturation of the water. Oxygen and nitrogen varied between 98 and 120 per cent of air saturation, saturation increasing with increasing discharge. The excess gas was found to enter solution in the plunge basins at the bases of the falls. Two methods of treatment were tested in order to render the water suitable for hatchery use. The effects of supersaturation water on young salmon are described. A review of the rather considerable European literature is included. (Katz)
W77-05465

THE GAS DISEASE OF FISH DUE TO EXCESS OF NITROGEN, (IN JAPANESE),
Hiroshima Univ., (Japan). Dept. of Fisheries.
S. Egusa.
Journal of the Faculty of Fisheries and Animal Husbandry, Hiroshima University, Vol. 2 (1959), p. 157-183, 4 tab., 6 fig., 13 ref.

Descriptors: *Fish disease, *Fish physiology, Animal pathology, Nitrogen, Freshwater fish, *Supersaturation, Bioassay, Mortality, Carp, Minnows, Eels, Juvenile fish, *Laboratory techniques, *Methodology, Water temperature, Oxygen.
Identifiers: *Gas bubble disease, *Nitrogen supersaturation, *Detrimental nitrogen limit, Crucian carp, Bitterling, Killefish.

In order to clarify the relations between 'gas disease' of fish and the degree of supersaturation of dissolved nitrogen in the medium water, five species of fresh-water fish were exposed to flows of water containing relatively constant high concentrations of nitrogen, and the time taken from the initial exposure until visible signs of the disease appeared on the fish body and the survival time were recorded for individual fish. Experiments were performed at about 20 degrees C. Above a certain critical nitrogen level, symptoms characteristic of gas disease develop over the surface of the fish body, though being not necessarily followed by fatal lesions. This critical level is termed here the 'detrimental nitrogen limit.' With further increase in nitrogen concentration, a level is reached where the fish can no longer escape death from gas disease. This level is termed the 'lethal nitrogen limit.' These two limits were defined by determining two nitrogen levels: the level at which just 50% of the fish developed symptoms of gas disease during the experimental period of two weeks, and the level which just failed to cause 50% mortality within the same time period. (Katz)
W77-05466

ABIOGENIC GAS SUPERSATURATION OF RIVER WATER,
Bergeforsen's Hydroelectric Co. (Sweden).
A. Lindroth.
Archive fur Hydrobiologie, Vol. 53(4), 1957, p 589-597, 2 tab., 3 fig., 13 ref.

Descriptors: *Dams, Dam sites, Atmospheric gases, *Hydrostatic pressure, Hydroelectric

plants, Rivers, River flows, *Supersaturation, Analytical techniques, *Spillway, Water supply, Hydrology, On-site investigation, Oxygen.
Identifiers: *Abiogenic gas supersaturation, *Dissolved gases, Bergefonsen's Power Station.

From a theoretical point of view, a gas supersaturation through contact between air bubbles and water at some depth is postulated. Investigations in the Swedish river Indalsalven have shown that natural waterfalls as well as water taken past power stations through spillways are inclined to build up a gas supersaturation, a finding which confirms earlier investigations and has, probably, very general application. The problem of gas supersaturation in rivers and other waters may, however, be more complex. The effects of gas supersaturation in natural waters and in fish rearing stations have also been touched upon. (Katz)
W77-05467

ON NITROGEN-GAS CONTENTS DISSOLVED IN FLOWING WATER OF ARTESIAN WELLS AND SPRINGS (RELATING TO HIGH SUPERSATURATION INDUCING THE SO-CALLED 'GAS DISEASE' UPON FISHES,
Y. Matsue, S. Egusa, and A. Saeki.
Bulletin of the Japanese Society of Scientific Fisheries, 1953, Vol. 19(4), p 439-444, 3 tab., 5 fig., 5 ref.

Descriptors: *Mortality, Fish diseases, Freshwater fish, *Artesian wells, *Spring waters, Dissolved oxygen, Nitrogen, *Supersaturation, On-site investigation, Water quality.
Identifiers: *Gas bubble disease, Divers disease, Caisson disease, *Nitrogen supersaturation, Japan, Kanagama prefecture.

Fish could not survive in the freely flowing groundwater in the vicinity of Odawana City. The dissolved oxygen content was sufficient but the nitrogen gas was greatly supersaturated. The death of fish was due to gas bubble disease and values of nitrogens above 130% were fatal to fish. Gas bubble disease is similar to caisson disease and diver disease of man. Nitrogen content of the wells varied from 118 to 159%--most were over 140%. Artesian wells have nitrogen contents o 146 and 161% but low values of dissolved oxygen (below 10%). (Katz)
W77-05468

THE INFLUENCE OF THE GAS CONTENT OF SEA WATER ON FISH AND FISH LARVAE,
E. Henly.
Rapport Proc-Verbaux Internationale Conseil pour la Exploration de la Mer. Vol. 131(3), 1952, p 24-27, 1 fig., 5 ref.

Descriptors: *Aquiculture, *Fish hatcheries, Demersal fish, Dissolved oxygen, Mortalities, Fish kills, *Fish behavior, Fish physiology, *Supersaturation, *Marine fish, Juvenile fish, Pelagic fish, Fish disease, Larvae, Oysters, Herring, Sea water.
Identifiers: *Gas bubble disease, *Oxygen supersaturation, Air bladders, Fish larvae, Cod, Plaice, Flodevig, *Air bladder gas control.

The problem of gas bubble disease has been severe in the marine hatchery at Flodevig. Cod larvae are very sensitive to gas concentration in shallow aquaria. The air bladders expand until the fish float helplessly on the surface. Fish with closed air bladder react differently. The gas bubbles are formed in the intestines. Oyster larva suffer mortalities if the oxygen content becomes too high. The gas content of water entering the Flodevig hatchery has been reduced by filtering the water twice through sand filters. (Katz)
W77-05469

FACTORS AFFECTING THE SURVIVAL OF FISH LARVAE,
A. Dannevig, and G. Dannevig.
Journal du Conseil, Vol. 15, 1950, p 277-283, 9 ref.

Descriptors: *Supersaturation, Atmospheric gases, *Aquiculture, *Fish hatchery, Fish diseases, Animal physiology, *Herrings, Juvenile fish, Demersal fish, On-site investigations, Water supply, *Marine fish.
Identifiers: *Fish larvae, Sole, Solea solea, Plaice, *Gas bubble disease, Flodevig, Intestines, Air bladder, Swim bladder, *Gas blisters, *Excess gas elimination.

At a marine hatchery, Flodevig, it was apparent that gas content of water was important in the culture of cod and herring larvae. Young fish reared in water from a large reservoir which had attained suitable temperature developed gas bubble disease and died. Cause of the gas bubbles was clearly the use of water supersaturated with atmospheic gas. Sea water supersaturated with gas may also have had a bad effect on older fish kept in the laboratory. The function of the air bladder is discussed. In laboratory tests, surplus gas was eliminated by filtering the sea water through sand. (Katz)
W77-05470

OBSERVATIONS ON GAS BUBBLE DISEASE OF FISH,
Fish and Wildlife Service, Seattle, Wash.
R. R. Rucker, and K. Hodgeboom.
The Progressive Fish Culturist, Vol. 15, p. 24-26, 1953. 3 fig.

Descriptors: *Fish disease, *Water supply, *Dissolved oxygen, Nitrogen, *Supersaturation, *Mortality, Rainbow trout, Fish pathology, Spring water, Flumes, *Fish hatchery, Atmospheric gases, Cutthroat trout, Water temperature.
Identifiers: *Steelhead trout, *Hatchery troughs, *Hatchery pond, Hatchery aerator, Puyallup Hatchery.

Gas bubble diseased fry was evident in trout fingerlings which were raised in hatchery troughs. Mortalities decreased and evidence of the disease disappeared when the fish were moved to outside ponds. Incoming water was 80% saturated with oxygen and 120 percent with nitrogen gas. A flume was installed which reduced the nitrogen content to 110 percent at which level gas disease symptoms were no longer observed. (Katz)
W77-05471

REMOVAL OF EXCESS NITROGEN IN A HATCHERY WATER SUPPLY,
Fish and Wildlife Service, Seattle, Wash.
R. R. Rucker, and E. M. Tuttle.
The Progressive Fish-Culturist, Vol. 10(1948), p 88-90, 1 tab., 2 fig., 2 ref.

Descriptors: *Nitrogen, *Supersaturation, *Fish hatchery, Engineering structures, Hydraulic structures, Fish establishment, Fish handling, Salmon, On-site investigation, Conduit, *Water supply, Settling basin.
Identifiers: *Nitrogen supersaturation, Excess nitrogen, *Deaeration structure.

Describes a deaerator in the supply line from wells supersaturated with nitrogen to the hatchery. From openings on either sides of the conduits the water drops into a series of five troughs each below the other. Nitrogen content of the water supply is reduced from 144% to 101%.
W77-05472

A SUDDEN MORTALITY OF FISHES ACCOMPANYING A SUPERSATURATION OF OXYGEN ON LAKE WAUBESA, WISCONSIN,
Wisconsin Conservation Dept., Madison.
L. A. Woodbury.
Transactions of the American Fisheries Society, Vol. 71(1941), p 112-117, 1 tab., 2 fig., 4 ref.

Descriptors: *Fishkill, Mortalities, Lakes, Fish diseases, *Dissolved oxygen, *Supersaturation, *Algae, Rough fish, Carp, Suckers, Walleye, Sunfishes, Photosynthetic oxygen, Wisconsin, Sunfishes.
Identifiers: Lake Waubesa(Wisc), Black crappies, Northern pike, Yellow pikeperch, *Gas bubble disease, Gas bubbles, *Gas emboli, *Chlamydomonas.

A heavy loss of fish occurred during April 1940, in the south end of Lake Waubesa, Wisconsin, and in the Yahara River below the lake. The fish affected were mainly black crappies, although bluegills, northern pike, yellow pikeperch, common suckers, and carp, were killed to a lesser extent. A heavy algal bloom composed principally of Chlamydomonas was concentrated in the area of fish loss and was accompanied by an extremely high (30-32 ppm) oxygen content in the surface water. Characteristic lesions were present in the fish and consisted primarily of gas emboli in the gill capillaries and gas bubbles in the subcutaneous tissues. Death of the fish was attributed to the blocking of the circulation through the gills by the gas bubbles with consequent respiratory failure. A suggestion is made that oxygen was the gas forming the bubbles. (Katz)
W77-05473

THE GAS-BUBBLE DISEASE OF FISH, THE CAUSES, ATTENDANT PHENOMENA AND CURE, (DIE GASBLASENKRANKHEIT DER FISCHE, URSACHEN, BEGLEITERSCHEINUNGEN UND ABHILFE),
Zagreb Univ. (Yugoslavia). Morphologische-Biologische Institut.
W. Mrsic.
Zeitschrift fur Fisherei, 1933, Vol. 31, No. 1, p. 29-67, 2 tab., 1 fig., 36 ref.

Descriptors: *Fish diseases, Trout, Fish hatcheries, Fish eggs, Juvenile fish, Carbon dioxide, Water temperature, Water quality, *Fish physiology, *Fish mortality, Laboratory tests, *Oxygen, *Nitrogen, *Supersaturation, Rainbow trout.
Identifiers: *Gas bubble disease, *Yolk sac disease, *Disease symptoms, Deformities, Free carbon dioxide.

The gas bubble disease of fish is caused by supersaturation of water with gas. This can be caused by the reduction of hydrostatic pressure of supersaturated water, increase in water temperature, photosynthesis by aquatic plants. Supersaturation of hatchery waters can be reduced by special apparatus which allows the water to equilibrate. Increasing water temperature increases the lethal action of the gases. Catfish, mussels and crustaceans are not affected in waters which are lethal to trout larvae. Gas bubble disease is not caused by a microorganism. (Katz)
W77-05474

THE ABILITY OF SEVERAL SPECIES OF FISH TO SURVIVE ON PROLONGED EXPOSURE TO ABNORMALLY HIGH CONCENTRATIONS OF DISSOLVED OXYGEN,
Bureau of Fisheries Lab., Fairport, Iowa.
A. H. Wiebe, and A. M. McGavock.
Transactions of the American Fisheries Society, Vol. 62 (1932), p. 267-274, 3 tab., 1 fig., 2 ref.

Descriptors: *Dissolved oxygen, *Supersaturation, Laboratory tests, *Bioassay, Saturation, Water temperature, Water quality, *Trout, *Bass, *Sunfish, Minnows, Rainbow trout, Brook trout.
Identifiers: Crappie, Largemouth bass, Smallmouth bass, Bluegill sunfish, Green sunfish, Goldfish, Golden Shiners, Blunt nosed minnows, *Gas bubble disease, *Pop-eye disease.

Last year at the meeting of this Society one of us, Wiebe ('32) reported on some experiments that were performed to test the ability of several spe-

cies of fish to live under an atmosphere of pure oxygen resulting in some instances in abnormally high concentrations of dissolved oxygen. During the discussions of that paper the point was made by some one that fish could survive such treatment during transportation but that they died within a few days after they had been planted. Because of the impression prevailing quite generally that the fish did not survive an exposure to abnormally high concentrations indefinitely, it was decided to perform some additional experiments. We, therefore, present here the results of some experiments performed to show that some species of fish at least can stand a prolonged exposure to abnormally high concentrations of dissolved oxygen and show further that these fish survive the experiment indefinitely. Fish were subjected for 19 days to oxygen supersaturations of 180% to 344%. (Katz)
W77-05475

RELATION OF TEMPERATURE TO THE INCUBATION PERIODS OF EGGS OF FOUR SPECIES OF TROUT,
Cornell Univ., Ithaca, N.Y.
G. C. Embody.
Transactions of the American Fisheries Society, Vol. 64 (1934), p. 281-292, 3 tab., 1 fig., 22 ref.

Descriptors: *Water temperature, *Fish eggs, Laboratory tests, Fish hatchery, Brook trout, Brown trout, Rainbow trout, Lake trout, *Juvenile fish, Fry, *Fish physiology, Fish diseases, Growth rate.
Identifiers: *Temperature units, *Development rates, Temperature range, *Normal development, Van't Hoff's Law.

The literature relating water temperature and the incubation of fish eggs (marine and freshwater species) were reviewed. Experiments with the eggs of brook trout, brown trout, rainbow trout were conducted. The data were plotted and the straight line character of each graph indicates conformity with Van't Hoff's Law. In cases where experimental temperatures were raised more than 5C, the resulting fry were badly affected with gas bubble disease. The condition was corrected to a large extent by passing the water over a series of baffles placed at the head of the trough. The eggs were not affected. (Katz)
W77-05476

THE REACTIONS OF FISHES TO GRADIENTS OF DISSOLVED ATMOSPHERIC GASES,
Chicago Univ., Ill. Hull Zoological Lab.
V. E. Shelford, and W. C. Allee.
Journal of Experimental Zoology, Vol. 14, p 207-266, 1913. 20 tab., 3 fig., 58 ref.

Descriptors: Freshwater fish, Fish behavior, *Supersaturation, *Ammonia, *Carbon dioxide, Bioassay, Mortality, *Nitrogen, *Acidity, Acidic water, Fish physiology, Laboratory, Water quality, Water pollution effects, *Atmospheric gases.

Oxygen is necessary for the life of fish while carbon dioxide is believed to be quite lethal. Fish are not affected by nitrogen except when water is supersaturated. In laboratory experiments, it was found that fish react negatively to some salts, nitrogen and carbon dioxide. The avoidance reaction is accompanied by coughing, gasping and gulping. Fish reacted negatively to acetic acid but did not react negatively to ammonia. (Katz)
W77-05477

STUDY OF THE TOXICITY OF RIVERS IN THE GENOA PROVINCE IN RELATION TO MARINE BIOMASS, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
D. Puel, G. Flatau, F. Laumond, M. Barelli, and M. Aubert.
Rev Int Oceanogr Med 41/42, p 143-157, 1976.

Descriptors: *Annelids, *Biomass, *Chromium, *Lead, *Mollusks, Rivers, *Toxicity, *Food chains.
Identifiers: *Genoa(Italy).

Trophodynamic chains were used to study the toxicity of 4 rivers in the neighborhood of Genova, Italy. This technology is useful for the determination of the direct toxicity and the induced toxicity along the biological marine chain. The direct toxicity of these rivers is low, but the study of the induced toxicity shows some bioaccumulation of Pb and Cr at the levels of annelids and molluscs. The study also shows that the accumulation of a given metal is a function of its chemical nature and a function of the intoxicated organisms.--Copyright 1976, Biological Abstracts, Inc.
W77-05478

THE GAS BUBBLE DISEASE OF FISH AND ITS CAUSE,
Brown Univ., Providence, R.I. Dept. of Biology.
F. P. Gorham.
Bulletin of the U.S. Fish Commission, Woods Hole, Massachusetts, Vol. 19, from 1899, (1901), p. 33-37, 3 tab., 1 fig., 2 ref.

Descriptors: *Fish diseases, Fish physiology, Fish behavior, *Marine fish, Aquiculture, *Animal pathology, *Supersaturation, *Hydrostatic pressure, Demersal fish, Sea bass, Stickleback.
Identifiers: *Gas bubble disease, *Marine aquaria, Shallow water fish, *Deep water fish, *Gas vesicles, Woods Hole, Massachusetts, Exopthalmia, Winter flounder, Tautag, Hake, Sea-robins, Puffer, Toad fish, Cunner, Pipe-fish.

Salt water fish kept in aquaria develop a disease which is manifested by the formation of vesicles of gas on the fins and other parts of the body. It is concluded that the gas bubble disease is caused by a reduction of pressure. Normally shallow water fish are never affected and the greater the normal depth of a fish the more severely it is affected. (Katz)
W77-05479

NOTES ON THE DISSOLVED CONTENT OF WATER IN ITS EFFECTS UPON FISHES,
Bureau of Fisheries, Woods Hole, Mass.
M. C. Marsh.
Bulletin of the U.S. Bureau of Fisheries, for 1908 (1910), Vol. 28, p. 891-906, 3 tab.

Descriptors: Salmon, Trout, *Aquiculture, *Oxygen, *Nitrogen, Mortality, Bioassays, Water quality, Laboratory apparatus, *Fish hatchery, *Supersaturation, *Atmospheric gases, Laboratory anaiysis, Potomac River.

Well water to be used in aquaria was lethal to trout. Fish turned over in a minute but recovered when placed in suitable water. The well water was deficient in oxygen and high in nitrogen. These deficiencies could be corrected by passing the water through an aerating apparatus. Both the deficiency of oxygen and the excess of nitrogen are corrected on the same apparatus. Procedures to determine the suitability of water for fish culture are outlined. (Katz)
W77-05480

THE GAS DISEASE IN FISHES,
Bureau of Fisheries, Woods Hole, Mass.
M. C. Marsh, and F. P. Gorham.
Report of the Commissioner of Fisheries, from 1904 (1905), p. 343-376, 4 tab., 3 fig., 20 ref.

Descriptors: *Fish diseases, *Fish physiology, Fish behavior, Marine fish, Animal pathology, *Supersaturation, *Hydrostatic pressure, Demersal fish, *Oxygen, *Nitrogen, Atmospheric gas, Sea water.
Identifiers: *Gas bubble disease, *Lesions, *Gas bubble disease symptoms, Exopthalmia, Asphyxiation, Deep-sea fishes, *Supersaturated spring water.

One of the chief lesions of gas bubble disease is exopthalmia. The immediate cause of death is usually asphyxia from gas embolism in the gill filaments or heart or both. The gas emboli are due to an excess of dissolved air in the blood, which may be caused by a rapid reduction of pressure or by an excess of dissolved gas in the water or by a combination of both. Nitrogen excess is more important than oxygen excess and can singly cause the disease process. (Katz)
W77-05481

BIOCHEMICAL, MORPHOLOGICAL, AND PHYSIOLOGICAL STUDIES ON THE METHANE OXIDIZING BACTERIUM, METHYLOSINUS TRICHOSPORIUM, WITH EMPHASIS ON STRUCTURE, FUNCTION, AND COMPOSITION OF THE INTRACYTOPLASMIC MEMBRANES,
Ohio State Univ., Columbus. Dept. of Microbiology.
T. L. Weaver.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 743, Price codes: A11 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1973. 228 p, 49 fig, 20 tab, 95 ref, append. OWRT A-027-OHIO(3).

Descriptors: *Methane bacteria, *Methane, *Membranes, Lipids, *Bacteria, Chromatography, Centrifugation, Water pollution effects, Pollutant identification.
Identifiers: *Methane oxidizing bacteria, *Methylosinus trichosporium, Gas-liquid chromatography, Thin layer chromatography, Phospholipids, Fatty acids.

In a mineral salts medium with methane as the only carbon source, the bacterium had a generation time of 5.3 hours and a growth constant of 0.1312 hours-1. About 50% of the methane oxidized was fixed into cell material, and 1 oxygen atom was consumed for each oxidative step in the methane oxidation process. The intracytoplasmic membranes, which were about 9 nm. thick, formed flattened balloon-like vesicles near the cell periphery. The internal membrane vesicles appeared to be passed along during budding. Cells contained 9.2% lipid consisting of nearly equal amounts of poly-beta-hydroxybutyrate, simple lipids, and phospholipids. Intracytoplasmic membranes contained 27.9% lipid which was mostly phospholipid. Phosphatidyl ethanolamine phosphatidyl glycerol accounted for 94% of the membrane phospholipids. All the membrane phospholipids contained about 88% 18:1 fatty acids and 12% 16:1 fatty acids. The intracytoplasmic membranes contained 5 major proteins separated by polyacrylamide gel electrophoresis. These proteins ranged in molecular weight from 47,000 to 180,000 and averaged 27% polar amino acids. It is concluded that methane oxidation and fixation are not membrane bound processes in this bacterium. Rather, the intracytoplasmic membranes function as organelles of electron transport and energy entrapment. The intracytoplasmic membranes were morphologically and biochemically similar to the internal membranes of the photosynthetic and nitrifying bacteria. (Chao-Ohio State)
W77-05482

STUDIES ON THE DISTRIBUTION OF 14 C LABELLED PCB IN THE BODY. II. THE DISTRIBUTION IN GOLD FISH (CARRASIUS AURATUS), (IN JAPANESE),
Nihon Univ., Tokyo. Lab. of Veterinary Hygiene.
S. Nago, J. Hosoya, and T. Kugoh.
Bull Coll Agric Vet Med Nihon Univ 32, p 232-240, 1975.

Descriptors: *Polychlorinated biphenyls, Path of pollutants, Fish, Pollutant identification, Distribution, Carbon radioisotopes.

Identifiers: *Carassius-auratus, *Carbon-14, *Goldfish, *Radiography.

14 C-PCB (polychlorinate biphenyl) distribution in fish (C. auratus) was studied by autoradiography. 14 C-PCB solution (0.1 micro Ci) was administered by 1 of 2 methods. PCB solution was mixed in the environmental H2O of the fish or was administered orally. Each fish was kept in 300 ml of H2O in a 500 ml beaker. The fish were killed for autoradiography at 1,3,6 and 24 h of the experiments. Water radioactivity was analyzed at each experimental time as cpm (counts per mim)/ml. When PCB was added to the environmental H2O, H2O radioactivity was reduced in direct proportion to the contact time between the fish and the H2O; the autoradiogram showed that radioactivity of the sectioning body plate increased in parallel with the contact of the fish with the H2O. When orally administered, radioactivity in the H2O and autoradiogram increased in direct relation to the contact time. In both cases, 14C-PCB was found in the brain and spinal cord, a special finding as compared to other animals.--Copyright 1976, Biological Abstracts, Inc.
W77-05488

POWER PLANTS, CHLORINE AND ESTUARIES,
Environmental Research Lab., Narragansett, R.I.
J. H. Gentile, J. Cardin, M. Johnson, and S. Sosnowski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 957, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-76-055. June 1976. 28 p, 5 fig, 7 tab, 27 ref.

Descriptors: *Environmental effects, *Chlorine, *Chlorination, Plankton, *Bioassay, Entrainment, Powerplants, Photosynthesis, *Estuaries, Pollutant identification.

Biological assay systems using indigenous holo- and meroplankton were designed to model the chlorination patterns of power plants. A matrix of chlorine concentrations and exposure patterns permitted the generation of response isopleths that were then applied to developing design criteria. Thalassiosira pseudonana showed a 50% reduction in photosynthesis at exposure to 0.15 ppm chlorine for 10 minutes. Complete growth inhibition occurred after exposure to 0.3 ppm chlorine for 5 minutes. Microzooplankton showed a 50% mortality at exposure to 2.5 ppm chlorine for 5 minutes. Larval and juvenile fish were sensitive to chlorine levels less than or equal to 0.2 ppm for exposure of 60-90 minutes. Two field studies were evaluated and compared to laboratory data with emphasis on the use of ATP to monitor entrainment and damages. (Chilton-ORNL)
W77-05491

COPPER UPTAKE BY ALGAE FROM COPPER-CONTAINING COMPOUNDS AND THE EFFECT OF THIS PROCESS ON THEIR SALT METABOLISM, (IN RUSSIAN),
Moscow State Univ. (USSR).
V. G. Khobot'ev, V. I. Kapkov, E. G. Rukhadze, N. V. Turunina, and N. A. Shidlovskaya.
Gidrobiol Zh 12(1), p 40-46, 1976.

Descriptors: *Metabolism, *Copper, *Scendesmus, Algae, *Anabaena, Algicides, *Copper compounds, Toxicity, Potassium, Salts, *Absorption.

A direct relationship exists between Cu accumulation by the cells (Scenedesmus quadricauda, Anabaena variabilis) and algicide action of the compounds. The high biocide activity is due to the ability of the cells to absorb great concentrations of the metal from the compounds with a coordination bond between the metal and the ligand. Toxic (0.78.10-5-7.8.10-5 M) concentrations of complex Cu compounds disturb the salt metabolism in cells due to Cu accumulation or K loss. If the concentration of a Cu compound with a coordination bond is 7.8.10-5 M, the content of K in the cells decreases by 80% within 30-60 min.--Copyright 1976, Biological Abstracts, Inc.
W77-05493

THE BACTERICIDAL EFFECT OF BDELLOVIBRIO BACTERIOVORUS, ONE OF THE ORGANISMS EFFECTIVE IN AUTO-PURIFICATION OF WATER, (IN TURKISH),
Hifzissiha Okulu, Ankara (Turkey). Halk Sagligi Lab.
A. Yucel.
Mikrobiyol Bul 9(3), p 173-181, 1975.

Descriptors: *Bactericides, Water purification, *Self purification, Rivers, Water pollution treatment.
Identifiers: Ankara, *Bdellovibrio-bacteriovorus, Kayas, Turkey, *Hatip Cayi River(Turkey).

B. bacteriovorus exhibits bactericidal activity in auto-purification of water. A Bdellovibrio was isolated from Hatip Cayi river near Kayas, Ankara, Turkey.--Copyright 1976, Biological Abstracts, Inc.
W77-05494

THE EFFECTS OF ORGANIC AND NUTRIENT ENRICHMENT ON THE BENTHIC MACROINVERTEBRATE COMMUNITY OF MOGGILL CREEK, QUEENSLAND (AUSTRALIA),
Environment Science and Services, Brisbane (Australia).
C. C. McIvor.
Water (Journal of the Australian Water and Wastewater Association) Vol. 3, No. 4, p. 16-21, December 1976. 6 fig, 1 tab, 19 ref.

Descriptors: *Sewage effluents, *Invertebrates, *Water pollution effects, *Streams, *Australia, *Nutrients, Water pollution sources, Algae, Biological communities, Aquatic animals, Bioassay, Growth rates.
Identifiers: *Moggill Ck.(Qld.).

Biological analysis utilizing species diversity and community analysis by taxonomic group was conducted montly on macroinvertebrate collections from Moggill Creek to characterise the normal community composition and record the effects of a sewage treament plant effluent. Chemical analyses indicated nutrient enrichment downstream of the outfall while an analysis of growth on glass microscope slides revealed significantly greater algal growth in this lower reach. Species diversity was severely reduced during low flow periods as a result of the treatment plant effluent. Moggill Creek is subject to scour during heavy rainfall and following these spates diversity is more uniform throughout the creek. In the upper reaches Moggill Creek is characterised by a stable invertebrate community composed of a number of taxonomic groups including mayflies, stoneflies, caddisflies and dragonfly nymphs. Downstream of the outfall these groups are absent in low flow periods and the communities tend to be dominated by chironomids and amphipods. The applicability of the Sequential Comparison Index for assessing species diversity of the Australian freshwater macrofauna is illustrated. (CSIRO)
W77-05529

THERMAL ECOLOGY II.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-750 425, Price codes: A12 in paper copy, A01 in microfiche. ERDA Symposium Series 40, Report CONF-750425. Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. Edited by G. W. Esch and R. W. McFarlane. 1976, 404 p.

Descriptors: *Conferences, *Thermal stress, *Ecology, Aquatic environment, Publications, *Thermal pollution, Water pollution effects, *Environmental effects.
Identifiers: *Thermal ecology.

The second Thermal Ecology Symposium was jointly sponsored by the Savannah River Ecology Laboratory; the Institute of Ecology, University of Georgia; and the United States Energy Research and Development Administration. The bulk of the volume is comprised of contributed papers of the symposium. Four invited papers present an overview of thermal ecology and the remainder of the papers are grouped under the headings of temperature and physiological parameters, thermal tolerance, temperature and fish behavior, environmental impact of electric power facilities, and impingement, entrainment, and electric power facilities. A total of 57 papers is included as well as a subject index. (See W77-05542 thru W77-05598) (Chilton-ORNLL)
W77-05541

THE POWER PARK CONCEPT: AMELIORATING MAN'S DISORDER WITH NATURE'S ORDER,
Georgia Univ., Athens, Inst. of Ecology.
E. P. Odum, and R. L. Kroodsma.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 1-9, 6 tab, 5 fig, 9 ref.

Descriptors: *Environmental effects, Powerplants, Ecosystems, Habitats, Wastes, Industrial wastes, *Georgia, *Parks, *Landscaping.
Identifiers: *Power parks, Savannah River Project(Geo).

A power park is defined as a designated area of the landscape or a complex of natural ecosystems set aside and managed for the assimilation of large volumes of dilute and degradable end products of energy conversion and urban-industrial activity. The role of the Savannah River Project in developing the power park concept is discussed. The large size and high natural diversity of the SRP reservation are identified as making it an ideal location for basic research and experimentation on the concept. (See also W77-05541) (Chilton-ORNL)
W77-05542

FACTORS INFLUENCING THERMAL TOLERANCES OF INDIVIDUAL ORGANISMS,
Oklahoma Univ., Norman. Dept. of Zoology.
V. H. Hutchison.
In: Thermal Ecology II, Proceedings of a Symposium held at August, Georgia April 2-5, 1975. CONF-750425, 1976. p 10-26, 19 fig, 118 ref.

Descriptors: *Environmental effects, *Thermal stress, Temperature, Resistance, Ecology, Methodology, Testing procedures, Measurement.
Identifiers: Experimental methods, Standardization.

Discussed is the need for standardization of testing methods and difinitions and an appreciation of often overlooked factors which may alter thermal tolerances in subtle ways. Temperature is identified as being perhaps the most pervasive of all the physical factors of the environment, mediating the effects of most other environmental factors and being influenced reciprocally. Factors which influence the thermal tolerance of organisms (photoperiod, seasonal and daily cycles, geographic variation, diet, sex, breeding condition, age, life-cycle stage, salinity, chemicals, body water content and partitioning, oxygen supply, pH, innate and learned behavior, history of thermal exposure, and sublethal exposure to limiting factors) as well as the experimental measurement of thermal effects are summarized. (See also W77-05541) (Chilton-ORNL).
W77-05543

THERMAL ALTERATION AND THE ENHANCEMENT OF SPECIES POPULATIONS,
Savannah River Ecology Lab., Aiken, S.C.
J. W. Gibbons.
In: Thermal Ecology II, Proceedings of a Symposium held in Augusta, Georgia, April 2-5, 1975. CONF-750425, 1976. p 27-31, 1 fig, 23 ref. AT: 38-1:819.

Descriptors: *Environmental effects, *Thermal stress, *Water pollution effects, Productivity, Aquatic populations, Thermal pollution.
Identifiers: Positive responses.

Data are presented which show that the environmental energy supplement resulting from thermal loading is often converted into positive returns for aquatic populations. The temperatures invoking positive responses in different populatons may vary both absolutely and in their level above ambient. An explicit feature of the population-enhancement idea is that different species will respond positively to temperature increases at different points along the spectrum of thermal change from a subtle rise to a major one. Artificial temperature elevations may negatively alter the total environment but, on the way toward a negative response, most populations will pass through a positive-response phase. (See also W77-05541) (Chilton-ORNL)
W77-05544

HEATED WASTE-WATER EFFECTS ON AQUATIC ECOSYSTEMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
J. Cairns, Jr.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 32-38, 2 tab, 18 ref.

Descriptors: *Environmental effects, *Thermal pollution, Water pollution, *Thermal stress, *Ecosystems, Aquatic environment, Waste water(Pollution), Evaluation, Measurement, Testing procedures.

While gross displacement of biological integrity can be detected by presently available methods, the more subtle indications preceding gross disruption may not be adequately detected by the present methods. Three case histories are discussed including one in which corrective action reversed a structural change. Three criteria which are identified as being of importance in determining whether a system can assimilate heated waste water discharges without being degraded are the ability to recover from change, the ability to resist displacement, and the number of times a system can snap back after displacement. The process of evaluation should be more standardized and should get more rigorous academic review than is now the case. (See also W77-05541) (Chilton-ORNL)
W77-05545

POTENTIAL INFLUENCE OF THERMAL EFFLUENTS ON THE PRODUCTION AND WATER-USE EFFICIENCY OF MANGROVE SPECIES IN SOUTH FLORIDA,
San Diego State Univ., Calif. Dept. of Biology.
P. C. Miller, W. A. Stoner, J. Hom, and D. K. Poole.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 39-45, 5 fig, 1 tab, 21 ref.

Descriptors: *Environmental effects, *Thermal stress, *Model studies, Photosynthesis, Productivity, *Mangrove swamps, *Florida.

Data on mangrove-water relations and photosynthesis and energy-balance relationships between solar and infrared radiation, wind, air and surface temperature, and humidity profiles in mangrove canopies in south Florida were synthesized in a simulation model of leaf energy exchange, water relations, and photosynthesis. The model (which includes only canopy microclimate interaction) calculates the diurnal courses of these processes for leaves at different levels in the canopy. Daily net photosynthesis was suppressed throughout the year by air temperatures more than 5C above ambient. Peak production occurred in spring. Increased air temperature shifted the diurnal pattern of photosynthesis in winter (maximum photosynthesis ocurring at midday) to the pattern of summer (maximum occurring in early morning and late afternoon). Although photosynthesis in Laguncularia racemosa showed the greatest sensitivity to temperature changes, Rhizophora mangle is expected to be most adversely affected by increased temperatures. (See also W77-05541) (Chilton-ORNL)
W77-05546

ROOTING AND GROWTH OF RED MANGROVE SEEDLINGS FROM THERMALLY STRESSED TREES,
Puerto Rico Nuclear Center, Mayaguez.
M. D. Banus, and S. E. Kolehmainen.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 46-53, 6 fig, 3 tab, 6 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Mangrove swamps, Thermal stress, Heated water, *Puerto Rico, Bays.
Identifiers: *Guayanilla Bay(P.R.).

Red mangrove seedlings from thermally stressed trees (water temperature 10-8 C above ambient) were found to be significantly smaller than those from nonthermally stressed trees in Guayanilla Bay and from trees in unpolluted bays from western Puerto Rico. Seedlings from thermally stressed trees developed negative buoyancy and initial roots faster than seedlings from nonthermally stressed trees but the development of the first pair of leaves was slower. The absence of growing seedlings in 38C water gave additional evidence of stress to which the mangroves were subjected. (See also W77-05541) (Chilton-ORNL)
W77-05547

THE EFFECTS OF THERMAL LOADING ON THE GROWTH AND ECOLOGY OF A NORTHERN POPULATION OF SPARTINA ALTERNIFLORA,
Maine Univ., Orono. Dept. of Botany and Plant Pathology.
R. L. Vadas, M. Keser, P. C. Rusanowski, and B. R. Larson.
In: Thermal Ecology II, Proceedings of a Symposium held in Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 54-63, 7 fig, 2 tab, 25 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Water pollution effects, Thermal stress, Resistance, Nuclear powerplants, Waste water(Pollution), Ecology, Productivity, Marsh plants, *Growth rates.
Identifiers: *Marsh grass, *Spartina alternoflora.

The introduction of thermal effluents into a boreal salt marsh altered the phenology, abundance, growth, and production of the dominant grass Spartina alterniflora. Plant densities increased slightly the first year, but all other measures of vigor were reduced. With the deterioration of rhizomes, collapse of the population is imminent. The marked southern distribution and abundance of S. alterniflora and the anticipated amelioration of cold stress suggest that this northern population may have lost the ability to tolerate high temperatures. (See also W77-05541) (Chilton-ORNL)
W77-05548

EFFECTS OF A THERMAL EFFLUENT ON THE REPRODUCTION OF THE AMERICAN OYSTER,
Delaware Univ., Lewes. Marine Studies Complex.
J. C. Tinsman, S. G. Tinsman, and D. Maurer.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 64-72, 6 fig, 29 ref.

Descriptors: *Environmental effects, *Water pollution effects, Thermal pollution, Reproduction, *Oysters.

Classical and quantitative methods were used to document changes in the developmental cycle of oysters due to the influence of a thermal effluent. No changes were seen in the time of maximum ripeness and spawning activity between oysters in heated and nonheated water but oysters in the heated water did show precocious gonadal development in the spring as well as an extension of the spawning season for several weeks. During 1972, a season of high mortality among oysters in effluents coincided with a period of lower level of gonadal development than was found in controls. If this decreased level of reproductive effort continued or showed further decline, there could be long-term effects on the recruitment of oysters inhabiting such effluents. (See also W77-05541) (Chilton-ORNL)
W77-05549

EFFECT OF TEMPERATURE ON GROWTH, MORTALITY, REPRODUCTION, AND PRODUCTION OF ADULT SNAILS,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
J. S. Mattice.
In: Thermal Ecology II, Proceedings of a Symposium held in Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 73-80, 6 fig, 2 tab, 21 ref.

Descriptors: *Environmental effects, *Temperature, *Snails, *Growth rates, Mortality, Reproduction, Productivity, *Growth stages.
Identifiers: Lymnaea abrussa.

Shell length and egg production of snails were measured daily under constant and under varying temperature regimes during the reproductive period. Production exhibited a general rule of increase with temperature to a maximum, followed by a decrease at higher temperatures. Growth rate, survivorship, and lengths of growth and reproductive periods also followed this rule. A lowered production of large snails in relation to small ones implied a decreased ability to obtain food and/or to utilize it. Growth rate of large snails was unaffected at 15C. Growth and reproductive periods were longest, production was highest, and mortality rate was lowest at 15C. (See also W77-05541) (Chilton-ORNL)
W77-05550

EFFECTS OF CONSTANT AND CYCLIC TEMPERATURE REGIMES ON THE PELAGIC LARVAL DEVELOPMENT OF A BRACHYURAN CRAB,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
A. N. Sastry.
In: Thermal Ecology II, Proceedings of a Symposium held in Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 81-87, 4 fig, 4 tab, 28 ref. EPA R800981.

Descriptors: *Environmental effects, *Temperature, Cycles, Growth stages, Larval growth stage, Larvae, *Crabs.
Identifiers: Cyclic temperature regimes, Cancer irroratus.

The results presented suggest that both resistance and capacity adaptations of larval stages exposed to varying environmental conditions are different from those of larvae at constant temperatures.

Survival of all the larval stages cultured at 10-20C and at 15-25C cycles was better that that of larvae cultured at comparable constant temperatures. Larval survival was better at 10-20C than at 12.5-17.5C. At the 17.5-22.5C cycle the larvae developed to the megalops stage only. A comparison of the 12.5-17.5 and the 10-20 C cycles to the constant 20C showed that duration of the zoeal stages decreased at both varying regimes while the duration of the megalops stage increased at the varying regimes. Duration of the megalops stage showed a considerable increase at a varying regime of 15-25C compared to a constant 20C. Megalops appeared to be a more sensitive stage than earlier ones. (See also W77-05541) (Chilton-ORNL)
W77-05551

SOME EFFECTS OF TEMPERATURE, CHLORINE, AND COPPER ON THE SURVIVAL AND GROWTH OF THE COON STRIPE SHRIMP,
Battelle Pacific Northwest Labs., Sequin, Wash. Marine Research Labs.
C. I. Gibson, T. O. Thatcher, and C. W. Apts.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 88-92, 2 fig, 3 tab, 12 ref.

Descriptors: *Environmental effects, *Temperature, Thermal stress, *Chlorine, *Copper, *Shrimp, *Mortality, *Growth rates, Animal growth.
Identifiers: Coon stripe shrimp, Pandalus danae.

Bioassay and growth-rate experiments were conducted on coon stripe shrimp to determine the LL50 value for heat and the LC50 values for chlorine and copper, and the effect of sublethal concentrations of these materials on the growth rate of the shrimp. Critical Thermal Maximum (CTM) values were found to increase with an increase in size and rate at which the temperature was elevated. Shrimp were more resistant to chlorine when acclimated and exposed at 8-10C than when acclimated at 8C and exposed at 15 or 20C or when acclimated and exposed at 15C. Optimal growing temperature for periods up to one month was 16C. Copper concentrations of 0.041 mg/l effectively retarded the growth at 16C over a 1-month period. Chlorine concentrations of 0.18 mg/l were lethal at 16C and reduced growth of the shrimp at 0.08 mg/l over a 1-month period. (See also W77-05541) (Chilton-ORNL)
W77-05552

EFFECTS OF POWER-PLANT ENTRAINMENT TEMPERATURES ON OXYGEN CONSUMPTION PATTERNS OF AMPHIPODS AND GRASS SHRIMP,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
D. T. Burton, S. L. Margrey, and L. B. Richardson.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 93-99, 3 tab, 40 ref.

Descriptors: *Environmental effects, *Thermal stress, Temperature, Oxygen, Oxygen requirements, *Amphipoda, *Shrimp, *Entrainment, Metabolism, Respiration.
Identifiers: Oxygen consumption patterns.

Base-line metabolism of Gammarus and Palaemonetes was determined at 15 min intervals for 90 min before the organisms were exposed to (1) a rapid 5C thermal increase, (2) a 4 min exposure at elevated temperature, and (3) a 15 min decay back to ambient temperatures. Oxygen consumption of Gammarus during the first 30 min following thermal exposure was significantly higher than the mean oxygen consumption during preexposure study in all acclimation groups (5, 15, and 25C). It returned to initial preexposure levels within 45 min in all cases. No significant changes were found in oxygen consumption patterns of control amphipods or of control and exprerimental Palaemonetes at any of the acclimation temperatures (5, 15, 25, and 30 C) as a result of thermal exposure. Oxygen consumption changes in Gammarus represented normal physiological temperature-compensation responses, not thermal-stress responses. (See also W77-05541) (Chilton-ORNL)
W77-05553

GROWTH OF SALMONID FISHES FROM HEATED AND UNHEATED AREAS OF LAKE MICHIGAN-MEASURED BY RNA-DNA RATIOS,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
S. A. Spigarelli, and D. W. Smith.
In: Thermal Ecology II, Proceedings of a Symposium held in Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 100-105, 2 fig, 3 tab, 16 ref.

Descriptors: *Environmental effects, *Thermal stress, Water pollution, Salmonids, Growth rates, Brown trout, Chinook, *Rainbow trout, Lake Michigan.
Identifiers: DNA, RNA, DNA-RNA ratios.

The mean RNA-DNA ratios measured in epaxial muscle samples of plume resident rainbow trout and chinook salmon were not statistically different from mean ratios of fish from two ambient temperature areas. The mean ratio of plume-resident brown trout was significantly higher than the combined controls ratio. For each species the ratios of the two controls were statistically different suggesting considerable natural variability in growth rates among individuals of a population. The fishes did not experience any severe changes in growth as a result of their residence in the thermal-plume area. (See also W77-05541) (Chilton-ORNL)
W77-05554

THE EFFECT OF TEMPERATURE, SALINITY, AND FOOD AVAILABILITY ON THE GROWTH AND FOOD-CONVERSION EFFICIENCY OF POSTLARVAL PINFISH,
National Marine Fisheries Service, Beaufort, N. C. Atlantic Estuarine Fisheries Center.
D. S. Peters, M. T. Boyd, and J. C. DeVane, Jr.
In: Thermal Ecology II, Proceedings of a Symposium held in Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 106-112, 4 fig, 5 tab, 7 ref.

Descriptors: *Environmental effects, *Temperature, *Salinity, *Food abundance, Larvae, *Growth rates, Feeding rates.
Identifiers: *Pinfish, Lagodon rhomboides.

Of the parameters measured, temperature accounted for most of the variation in maximum feeding rate. Temperature and feeding rate accounted for over 90% of the observed variation in growth rate. Maximum feeding capactity was relatively unaltered by salinity. Incrased temperature may alter food availability by changing food abundance, predatory effectiveness of the larvae, or escape capabilities of the prey. (See also W77-05541)
W77-05555

TEMPERATURE AS A GROWTH ACCELERATOR IN THE SPOT (TELEOST: SCIAENIDAE),
Virginia Electric and Power Co., Richmond, Environmental Services Dept.
J. C. White, Jr, R. A. Hammond, N. H. Wooding, Jr, and M. L. Brehmer.
In: Thermal Ecology II, Proceedings of a Symposium held in Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 113-117, 5 fig, 16 ref.

Descriptors: *Environmental effects, *Temperature, *Growth rates, Discharge(Water), Chlorination, *Teleosts.
Identifiers: *Spot, Leiostomus xanthurus.

The study documents the growth and survival of a population of fish inadvertently trapped in a discharge canal for up to 12 months, focusing on the growth of the spot, Leiostomus xanthurus. The fishes not only survided in an atypical environment (a wide spectrum of temperature changes and chlorination) but at least the spot exhibited accelerated growth characteristics never observed in natural waters. (See also W77-05541) (Chilton-ORNLL)
W77-05556

GROWTH RATES OF SUBADULT LARGEMOUTH BASS AT 24 TO 35.5C,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
C. C. Coutant, and D. K. Cox.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 118-120, 1 fig, 1 tab, 12 ref.

Descriptors: *Environmental effects, *Temperature, Thermal stress, *Growth rates, *Bass, Immature growth stage.

Tests were conducted on subadult largemouth bass weighing from 26 to 243 g at 13 temperatures between 24 and 35.5C. Growth was fastest at 26-28C with zero growth near 35.5C. The results suggest that the pattern of largemouth bass growth rate with temperature resembles the general form shown for sockeye salmon. There are characteristic temperature for optimum and zero growth. The temperature for optimum growth coincides with published behavioral preferences in the field. (See also W77-05541) (Chilton-ORNL)
W77-05557

THERMAL EFFLUENTS, FISH, AND GAS-BUBBLE DISEASE IN SOUTHWESTERN LAKE MICHIGAN,
Industrial Bio-Test Lab., Inc., Northbrook, Ill.
R. G. Otto.
In: Thermal Ecology II, Proceedings of a Symposium held in Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 121-129, 4 fig, 5 tab, 24 ref.

Descriptors: *Environmental effects, *Thermal pollution, Discharge(Water), *Fish diseases, *Supersaturation, Saturation, *Lake Michigan, Diseases.
Identifiers: *Gas-bubble disease.

In laboratory experiments, yellow perch were unaffeced by gas saturation levels as high as 115% and the 8-day median lethal saturation level was 126%. Rainbow trout were unaffeced by saturation levels of 110% and the estimated 8-day median lethal level was 119%. Data from field observation showed that apparently the heated effluents from power facilities affect different groups of fish during the period that gas supersaturation is prevalent. The onshore canal-type discharge influelced primarily large salmonids moving along the shoreline while the off-shore jet-type discharge resulted in changes in the temperature-gas supersaturation regime for waters occupied primarily by rainbow smelt. With the exception of carp, resident to the canal proper, fish captured in the vicinity of the Waukegan discharge showed no symptons of gas-bubble disease. This indicated that fish are nkot remaining in the canal for long periods. (See also W77-05541) (Chilton-ORNL)
W77-05558

THERMAL TOLERANCE OF ADULT ASIATIC CLAM,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
J. S. Mattice, and L. L. Dye.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 130-135, 4 fig, 2 tab, 24 ref.

Descriptors: *Environmental effects, *Temperature, *Thermal stress, Resistance, *Clams, Cold resistance, Heat resistance, Cooling water.

Tolerance tests included exposing clams to long-term heat stress, long-term cold stress, and heat shock. Exposure to tempeatures between 40C (5C acclimation) and 43C (30C acclimation, for 30 minutes caused 100% mortality. The upper and lower incipient lethal temperatures (50% mortality) were about 34 and 2C, respectively. The incipient lethal temperatures were shifted upward by acclimation to warmer temperature and downward by acclimation to cooler temperature. The upper lethal temperature for short-term shock (30 min exposure) was 43C. The heat-shock tests indicate the feasibility of using hot water to prevent larval fouling of cooling passages. (See also W77-05541) (Chilton-ORNL)
W77-05559

THE EFFECT OF ACCLIMATION ON THE TEMPERATURE TOLERANCE OF YOUNG MUSKELLUNGE FRY,
State Univ. of New York Coll. at Buffalo. Dept. of Biology.
K. C. Hassan, and J. R. Spotila.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 136-140, 3 fig, 3 tab, 25 ref. ERDA AT(11-1)-2502.

Descriptors: *Environmental effects, *Temperature, *Thermal stress, *Pikes, Fry, Resistance, Mortality.
Identifiers: *Muskellunge fry, Acclimation, Critical Thermal Maximum, CTM.

Results indicated that the temperature tolerance of the fry was readily altered by their past thermal history. Fish reared at 25C exhibited the highest temperature tolerance (33.2-36.1C) throughout their development. CTM values for fish reared at 15C ranged from 29.8-34.4C. A decrease in temperature tolerance was exhibited by these fish during their swim-up stage which was followed by a slow recovery period. Fry acclimated at 7C showed CTM values which ranged from an initial high of 34.0 on the first day to 27.2 at the end of the experiment. On the second day of the experiment, these fry entered a torpid state that lasted for 10 days and was followed by a general decrease in thermal tolorance and a high mortality rate. (See also W77-05541) (Chilton-ORNL)
W77-05560

THERMAL TOLERANCE OF STREAM CYPRINID MINNOWS,
Savannah River Ecology Lab., Aiken, S.C.
R. W. McFarlane, B. C. Moore, and S. E. Williams.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 141-144, 3 fig, 1 tab, 3 ref. AT(38-1)-310 & AT(38-1)-819 NSF GY-11167.

Descriptors: *Environmental effects, *Thermal stress, Temperature, Resistance, Heat resistance, Mortality, *Minnows, *Killifishes.

The minnows which were tested are excluded from thermally stressed streams. All species exhibited excellent survival at five rates of heating but rapid mortality occurred at 33 to 34C. Rapid heating appeared to shift the upper limit of thermal tolerance to a slightly higher temperature. Data showed that minnows can be acclimated to higher temperatures if they are exposed to a constant sublethal temperature for an extended period. (See also W77-05541) (Chilton-ORNL)
W77-05561

THERMAL TOLERANCE AND RESPIRATORY MOVEMENT OF BLUEGILL FROM TWO POPULATIONS TESTED AT DIFFERENT LEVELS OF ACCLIMATION TEMPERATURE AND WATER HARDNESS,
Savannah River Ecology Lab., Aiken, S.C.
J. C. Murphy, C. T. Garten, Jr., M. H. Smith, and E. A. Standora.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 145-147, 1 tab,l15 ref.

Descriptors: *Environmental effects, Thermal stress, Heat resistance, Respiration, *Sunfishes, Dissolved solids, Hardness(Water).
Identifiers: Respiratory rates, Acclimation temperature, Critical thermal maximum.

Results indicated that bluegill from the thermally elevated reservoir have a higher thermal tolerance than those from control areas. At 16C acclimation temperature, the mean CTM sish from the two areas was not significantly different but at 24 and 32C, fish from heated waters exhibited significantly higher CTM values than those from control areas. Increased water hardness tended to depress the mean CTM of bluegill at each location and acclimation-temperature treatment combination. Fish acclimated at 16C had a CTM of 32.3C at control concentrations of dissolved solids and a CTM of 30.6C at elevated concentrations. Increased water hardness was not observed to have a consistent effect on respiratory movement. (See also W77-05541) (Chilton-ORNL)
W77-05562

SOME RELATIONSHIPS OF UPPER THERMAL TOLERANCES TO PREFERENCE AND AVOIDANCE RESPONSES OF THE BLUEGILL,
Ichthyological Associates, Inc., Drumore, Pa.
S. E. Peterson, and R. M. Schutsky.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 148-153, 4 fig, 1 tab, 24 ref.

Descriptors: *Environmental effects, *Thermal stress, Heat resistance, *Sunfishes, Behavior, *Fish behavior, Temperature.

Upper incipient lethal temperatures of 23.3, 29.3, and 35.8C were determined for fish acclimated at 1, 13, and 27C, respectively. Bluegill acclimated at temperatures of 13C or higher avoided short term (96 hour) lethal temperatures. Preference temperatures were directly proportional to acclimation temperatures and consistently lower than avoidance temperatures. At acclimation temperatures of less than 13C avoidance temperatures were not reliable estimates of LT50. (See also W77-05541) (Chilton-ORNL)
W77-05563

FURTHER STUDIES OF COLD-SHOCK EFFECTS ON SUSCEPTIBILITY OF YOUNG CHANNEL CATFISH TO PREDATION,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
C. C. Coutant, D. K. Cox, and K. W. Moored, Jr.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 154-158, 2 fig, 3 tab, 8 ref.

Descriptors: *Environmental effects, *Thermal stress, Cold resistance, *Predation, *Channel catfish.
Identifiers: *Cold-shock fish, Cooling rates.

Channel catfish fed to predators immediately after a temperature decrease were preyed upon in greater numbers than controls when the cold shock was 6 and 10C. Cooling rate appeared to have a decided effect on thermal stress as represented by behavioral and/or performance changes that are reflected in susceptibility to predation. Rates slower than about 1.5C/min (for the 13C range tested) seemed to protect the young fish from cold-shock stress. Cooling rates of 2C/min and instantaneous cooling resulted in significant selective predation over control. (See also W77-05541) (Chilton-ORNL)
W77-05564

ACUTE COLD-SHOCK RESISTANCE OF GIZZARD SHAD,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
D. K. Cox, and C. C. Coutant.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 159-161, 2 fig, 1 tab, 12 ref.

Descriptors: *Environmental effects, *Thermal stress, Cold resistance, Mortality, Resistance.
Identifiers: Gizzard shad, *Cold shock(Fish).

The responses of gizzard shad to various degrees of cold shock (1, 2, 4, 6, 6.5, or 7C after acclimating for at least two weeks at 15, 17.5, or 20C) ranged from no apparent effect to complete mortality. Approximately 10% mortality occurred near 6C for shad acclimated at 15C with the prcentage moving up the temperature scale with an increase in acclimation temperature. Thus the 10% lethal threshold approached 7C for shad acclimated to 20C. Cessation of opercular movement occurred long after the loss of equilibrium and is therefore of doubtful ecological significance. Regression lines for times to equilibrium loss are identified as summaries of an ecologically significant response. (See also W77-05541) (Chilton-ORNL)
W77-05565

THE EFFECT OF COLD SHOCK ON THE VULNERABILITY OF YOUNG BLUEGILL TO PREDATION,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
W. R. Wolters, and C. C. Coutant.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 162-164, 1 tab, 9 ref.

Descriptors: *Environmental effects, *Thermal stress, Cold resistance, Resistance, Predation, *Sunfishes.
Identifiers: *Cold shock effect(Fish).

Increased temperature differential of cold shock caused a trend toward increased selective predation of bluegill between a 4 and 9C drop in temperature. At smaller temperature changes predartion took place much more slowly. The temperature differential shown in these experiments to be detrimental for long-term survival among predators appeared to be around 8-9C. (See also W77-05541) (Chilton-ORNL)
W77-05566

EFFECTS OF VARIOUS TIME-EXCESS TEMPERATURE HISTORIES ON HATCHING SUCCESS OF BLUEBACK HERRING, AMERICAN SHAD, AND STRIPED BASS EGGS,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
J. R. Schubel, and T. S. Y. Koo.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 165-170, 1 fig, 3 tab, 22 ref.

Descriptors: *Environmental effects, *Temperature, Time, Hatching, Eggs, *Herrings, *Bass.
Identifiers: *American shad, *Time-excess temperature studies, Striped bass, Blueback herring.

In the time-excess temperature studies, the maximum excess temperature ranged from 7-20C above ambient; exposure time was 4-60 minutes; and cooling time to final temperature was 60-300 minutes. Exposure to temperatures of 7 and 10C above ambient did not significantly affect the hatching success of eggs of any of the three species in early- to mid-embryonic stages of develop-

ment. Hatching success of American shad and blueback herring eggs was significantly reduced at excess temperatures of 15C and higher. Except for one subsample of striped bass eggs, total mortality occurred for all three species at excess temperatures of 20C. (See also W77-05541) (Chilton-ORNL)
W77-05567

BEHAVIORAL THERMAL REGULATION BY RAINBOW TROUT IN A TEMPERATURE GRADIENT,
Wilfrid Laurier Univ., Waterloo (Ontario).
R. McCauley, and N. Huggins.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 171-175, 3 fig, 1 tab, 17 ref.

Descriptors: *Fish behavior, *Environmental effects, *Temperature, *Behavior, Behavior patterns, *Rainbow trout, Water pollution, Heated water.

Temperature preferences were determined for rainbow trout weighing 150-250 g which had been induced to swallow miniature radio thermometers. Body temperatures were found to fluctuate within considerably narrower limits than did the environmental temperatures. Results demonstrated that thermal inertia between core temperature as indicated by the radio thermometers and environmental temperature is sufficient to account for the conservative thermal regime that exists in the body of the fish moving back and forth in a temperature gradient. These laboratory studies support field observations that fish in the neighborhood of a thermal plume are, in some instances, controlling their body temperatures by regular excursions into regions of varying temperatures. (See also W77-05541) (Chilton-ORNL)
W77-05568

BEHAVIORAL THERMOREGULATION BY BLUEGILL EXPOSED TO VARIOUS RATES OF TEMPERATURE CHANGE,
Wisconsin Univ., Madison. Lab. of Limnology.
T. L. Beitinger.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 176-179, 2 tab, 14 ref.

Descriptors: *Fish behavior, *Environmental effects, *Temperature, *Behavior, Behavior patterns, *Sunfishes, Heated water, Water pollution, Laboratory tests.

Bluegill were subjected to three combinations of temperature rate changes: heating rate twice the cooling rate; heating rate one-half the cooling rate; and heating and cooling rates equal. No significant differences were observed among the three groups for any of the performance parameters. Successful thermoregulation in a tank with no temperature differential indicated that bluegill are able to associate changes in spatial location with ultimate but not immediate changes in temperature and that direction of temperature change alone can serve as a behavioral reinforcer. (See also W77-05541) (Chilton-ORNL)
W77-05569

DAILY RATION, TEMPERATURE SELECTION, AND ACTIVITY OF BLUEGILL,
Wisconsin Univ., Madison. Lab. of Limnology.
W. E. Stuntz, and J. J. Magnuson.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 180-184, 3 fig, 9 ref.

Descriptors: *Fish behavior, *Environmental effects, *Behavior patterns, Food abundance, Temperature, *Sunfishes, Weight, Growth rates.

Bluegill were acclimated for a two week period at a temperature of 25C. During the temperature-selection phase of the experiments, both 0 and 2% daily ration caused fish to lose weight while fish receiving 4 and 6% of body weight daily rations grew throughout the experimental period. Preferred temperature, but not spontaneous activity, decreased at lower rations. It was concluded that bluegills use temperature selection as a method of decreasing rates of weight loss during periods when daily rations are low. At the same time they maintain rather high levels of activity thus being able to search large areas for food while reducing weight losses resulting from metabolic costs. (See also W77-05541) (Chilton-ORNL)
W77-05570

THERMAL PREFERENDA AND BEHAVIORAL THERMOREGULATION IN THREE CENTRARCHID FISHES,
Pennsylvania State Univ., Wilkes-Barre.
W. W. Reynolds, and M. E. Casterlin.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 185-190, 4 fig, 1 tab, 29 ref.

Descriptors: *Fish behavior, *Environmental effects, *Temperature, Behavior patterns, Laboratory tests, Sunfishes, Bass.

An electronic device was used which would permit fish to control ambient temperature by their movements. Results showed that mean temperatures occupied by bluegills did not differ significantly between day and night, nor did range, median, or midpoint temperatures. Modal preferenda did differ, however, increasing from 31.1 C at night to 32.3 C during the day. This reflects a difference in skewness of distributions; daytime distributions were negatively skewed but nighttime distributions were not. For the two bass species, means, medians, modes, ranges, and midpoints all differed between day and night, and skewness shifted from negative values by day to positive values at night. Shifts in modal preferenda may be involved in the evacuation of thermal discharges at night, in conjunction with distraction by other factors. (See also W77-05541) (Chilton-ORNL)
W77-05571

TEMPERATURE PREFERENCE AND MOVEMENT OF FISH IN RELATION TO A LONG, HEATED DISCHARGE CHANNEL,
Tennessee Valley Authority, Decatur, Ala. Browns Ferry Nuclear Plant.
W. B. Wrenn.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 191-194, 1 tab, 8 ref.

Descriptors: *Fish behavior, *Environmental effects, *Thermal pollution, *Water pollution, Heated water, Behavior patterns, Walleye, Bass, Catfishes, Discharge(Water), Movement.

Temperature-sensing ultrasonic transmitters were used to tag 6 smallmouth bass, 1 largemouth bass, two flathead catfish, and one walleye. Temperature preference and movement were monitored along a 4.5 km heated discharge channel from Colbert Steam Plant. Based on the actual time of known location, the largemouth bass remained in the extreme effluent temperatures about 4 hours and crossed the steep thermal gradient between the heated discharge and the ambient at least three times. Movements of the smallmouth bass also indicated that the effluent did not create a thermal barrier for these fish. One flathead catfish frequently selected temperatures above 30C. The walleye remained in the heated discharge for at least 30 days but the maximum effluent temperature during this interval was similar to the maximum temperature at which this species had been collected. (See also W77-05541) (Chilton-ORNL)
W77-05572

THERMAL ECOLOGY OF PHYTOPLANKTON IN A DESERT RESERVOIR,
Argonne National Lab., Ill.
R. D. Olsen, and M. R. Sommerfeld.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 195-201, 2 fig, 2 tab, 37 ref.

Descriptors: *Environmental effects, *Temperature, Populations, *Phytoplankton, Light, *Ecology, Diatoms, Algae, Water chemistry, Deserts, Reservoirs, *Seasonal.
Identifiers: *Desert reservoirs.

Seasonal succession and variance in population size of dominant phytoplankton species in Canyon Lake, Arizona were not correlated with the chemical factors despite the fact that significant fluctuations in concentrations of the major element and ion constituents were recorded. The data suggested that water temperature and light were the most important factors affecting periodicity of individual species. Annual peaks in the phytoplankton standing crop were recorded during early spring and mid- to late summer. The spring peak was composed primarily of centric diatoms, and the summer peak was dominated by filamentous Cyanophyceae. (See also W77-05541) (Chilton-ORNL)
W77-05573

INFLUENCE OF THERMAL LOADING ON THE ECOLOGY OF INTERTIDAL ALGAE,
Maine Univ. at Orono. Dept. of Botany and Plant Pathology.
R. L. Vadas, M. Keser, and P. C. Rusanowski.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 202-212, 6 fig, 1 tab, 22 ref.

Descriptors: *Environmental effects, *Thermal pollution, Water pollution effects, Ecology, Temperature, Algae, Populations, Intertidal areas.

The discontinuous discharge of heated effluents from a powerplant operation into Montsweag Bay produced variable hydrographic changes. Water temperatures, salinity and turbidity all increased in the discharge area. Distribution and abundance patterns of the dominant algae were altered. The events characterizing these changes involve (1) the demise of Fucus vesiculosus from the highest and lowest intertidal zones; (2) the slight expansion of Ascophyllum nodosum during the first year of plant operation into areas previously occupied by F. vesiculosus; (3) the compression of A. nodosum and understory algae during the second and third years of operation into a narrower and less dense band, accompanied by a reduction in biomass; and (4) colonization of bare rock by small populations of red algae. (See also W77-05541) (Chilton-ORNL)
W77-05574

RELATIONSHIP BETWEEN THERMAL LOADING AND PARASITISM IN THE MOSQUITOFISH,
Wake Forest Univ., Winston-Salem, N.C. Dept. of Biology.
J. M. Aho, J. W. Gibbons, and G. W. Esch.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 213-218, 3 fig, 1 tab, 23 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Parasitism, Population, Aquatic populations, Ecology, Trematodes.
Identifiers: *Mosquitofish, Gambusia affinis.

In the 980 mosquitofish, Gambusia affinis, examined the only parasite recovered were the metacercaria of two strigeid trematodes, Ornithodiplostomum ptychocheilus and Diplostomum scheuringi. O. ptychocheilus were always found oncysted in the brain and eyes and D. scheuringi was restricted to the body cavity.

Density of D. scheuringi was higher in fish from areas of ambient temperatures and density of O. ptychocheilus was higher in fish from areas receiving thermal effluent. Three hypotheses were formulated to explain the relationship between thermal loading and parasitism in G. affinis: (1) a direct differential influence of temperature on the physiological tolerance of the parasites; (2) a direct differential impact of temperature on the distribution of the molluscs that serve as the first intermediate hosts; and (3) an effect of temperature on the abundance and distribution of the potential definitive hosts within the study area. (See also W77-05541) (Chilton-ORNL)
W77-05575

EFFECTS OF A THERMAL EFFLUENT ON THE OSTRACODS OF PAR POND, SOUTH CAROLINA,
Rhode Island Univ., Kingston. Dept. of Zoology.
M. Bowen.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 219-226, 6 fig, 4 tab, 46 ref.

Descriptors: *Environmental effects, *Thermal pollution, Population, Aquatic populations, Temperature, Ecology, *South Carolina, Ponds, Lakes.
Identifiers: Ostracods, Par Pond(SC).

Four of the seven species of ostracods found in Par Pond (Stenocypris sp., S. Spinulosa, Cypretta viridis, and M. americana) are generally assumed to be tropical species while the other three species found (Cypridopsis vidua, Darwinula stevensoni, and Physocypria pustulosa) are common American species. Neither high maximum nor high minimum temperatures appeared to affect the total numbers of ostracods per sample but high minimum temperatures were correlated with low species diversity. The evidence in Par Pond points to the seasonal appearance of ostracods as a temperature-related phenomenon. (See also W77-05541) (Chilton-ORNL)
W77-05576

SEASONAL DISTRIBUTION OF A PODOCOPID OSTRACOD IN A THERMALLY ALTERED AREA OF TAMPA BAY, FLORIDA,
University of South Florida, St. Petersburg. Dept. of Marine Science.
C. D. Stiles, and N. J. Blake.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 227-234, 6 fig, 3 tab, 27 ref.

Descriptors: *Environmental effects, *Thermal pollution, Water pollution effects, Heated water, Population, Aquatic populations, Seasonal, Distribution, *Florida, Bays.
Identifiers: *Ostracods, *Tampa Bay(Fla).

Quantitative sampling was conducted in areas of maximum thermal influence and at a control site. Analysis for organic carbon, salinity, sediment, dissolved oxygen and temperature showed all parameters to be similar except temperature. The dominant ostracod was Haplocytheridea setipunctata. Maximum numbers of this ostracod were found at all stations in June. During warmer months, populations were limited in the area of thermal influence and it was concluded that temperature played a significant role in this limiting. Carapaces of individuals occurring in the thermal effluent were found to be depleted of calcium carbonate and it was not determined whether or not this was temperature related. (See also W77-05541) (Chilton-ORNL)
W77-05577

CHRONIC IN SITU EXPOSURE OF THE BAY SCALLOP TO POWER-PLANT EFFLUENTS,
University of South Florida, St. Petersburg. Dept. of Marine Science.
J. F. Studt, and N. J. Blake.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 235-242, 7 fig, 2 tab, 30 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Water pollution effects, Heated water, Temperature, Mortality, Reproduction, *Florida, Bays.
Identifiers: Bay scallop, Argopecten irradians concentricus, *Tampa Bay(Fla).

Bay scallops, Argopecten irradians concentricus, were transplanted to the vicinities of two powerplant installations (the P. L. Bartow site, Tampa Bay, Fla. and the Anclote estuary site, Tarpon Springs, Fla.). The mean increase in temperature above ambient was 6 C at the P. L. Bartow site and 2 C at the Anclote site. Results showed that mortality was greater in thermally altered areas than in ambient areas. With an elevation in temperature of 1-2C over ambient and increased total suspended load, increased mortality occurred as well as a reduction in reproductive amplitude. Oocytes are resorbed and reproduction ceases if scallops are continuously exposed to temperatures exceeding 25C during the early cytoplasmic growth stage. (See also W77-05541) (Chilton-ORNL)
W77-05578

EFFECTS OF THE PALISADES NUCLEAR POWER PLANT ON LAKE MICHIGAN,
Aquinas Coll., Grand Rapids, Mich. Div. of Natural Science.
R. S. Benda, and J. Gulvas.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 243-250, 5 tab, 9 ref.

Descriptors: *Environmental effects, *Thermal pollution, Water pollution effects, *Lake Michigan, Population, Aquatic populations, Temperature, Fish, Nuclear powerplants, Cooling water.

Results are summarized of 18 months of postoperational study conducted as part of a 7-year monitoring program. A total of 651,712 fish were impinged on the traveling screens (Alewife, 58.6%; slimy sculpin, 27.5%; spottail shiner, 7.2%; yellow perch, 4.4%). No significant change was observed in the abundance of the prominent species after the introduction of the thermal discharge. Data from C14 samples showed that primary productivity loss was 32.7% for a heated discharge and 17.9% for an unheated discharge. Discharge samples usually had a higher percentage of dead zooplankton than did intake samples. In general, the operation of the power plant did not have a significant impact on the lake. (See also W77-05541) (Chilton-ORNL)
W77-05579

EFFECTS OF POWER-PLANT OPERATION ON THE BIOTA OF A THERMAL DISCHARGE CHANNEL,
Cincinnati Univ., Ohio. Dept. of Biological Sciences.
M. C. Miller, G. R. Hater, T. W. Federle, and J. P. Reed.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 251-258, 3 fig, 3 tab, 26 ref.

Descriptors: *Environmental effects, *Thermal pollution, Water pollution space, Powerplants, Plankton, Phytoplankton, Algae, Mortality, Productivity, Discharge(Water), *Ohio River.

During a period in which the James Stuart Generating Station on the Ohio River opened four new units and a cooling tower, phytoplankton productivity and bacterial heterotrophic uptake potential for glucose were measured monthly for 4 years. Phytoplankton production was stimulated by small temperature increases over a broad range of ambient temperatures. At cooler ambient temperatures, increases up to an absolute temperature of about 25C were stimulatory. Higher absolute temperatures were frequently inhibitory or coupled with latent mortality from mechanical damage. Uptake potential for bacteria using glucose was inhibited, on the average, at higher, absolute temperatures than was algal production but maximal stimulation over a wide range of ambient temperatures occurred at an absolute temperature of about 25C. Zooplankton entrained in cooling waters suffered a significant increase in mortality as the water passed down the channel. (See also W77-05541) (Chilton-ORNL)
W77-05580

SEASONAL ABUNDANCE, BIOMASS, DIVERSITY, AND TROPHIC STRUCTURE OF FISH IN A SALT-MARSH TIDAL CREEK AFFECTED BY A COASTAL POWER PLANT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
M. Homer.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 259-267, 8 fig, 1 tab, 34 ref.

Descriptors: *Environmental effects, *Thermal pollution, Discharge(Water), *Seasonal, *Biomass, Aquatic populations, Trophic level, Salt marshes, Powerplants, Fish.
Identifiers: Diversity, Seasonal abundance.

The most striking differences between the discharge creek and the control creek were changes in seasonal abundance and biomass patterns. During warm months, biomass in the discharge creek was only 24% of that in the control creek and numbers in the discharge creek were only about 7% of those in the cntrol creek. In cooler months, the biomass in the discharge creek exceeded that of the control area by 12%, although abundance in the discharge creek during this period was 85% of the control creek. Diversity was lower in the discharge creek. No apparent differences in fish trophic structure were observed. (See also W77-05541) (Chilton-ORNL)
W77-05581

FISH DIVERSITY IN ADJACENT AMBIENT, THERMAL, AND POST-THERMAL FRESHWATER STREAMS,
Savannah River Ecology Lab., Aiken, S. C.
R. W. McFarlane.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 268-271, 1 tab, 1 fig, 10 ref. AT(38-1)-310 and AT(38-1)-819.

Descriptors: *Environmental effects, *Thermal pollution, Discharge(Water), Fish populations, Streams, Freshwater, Georgia.
Identifiers: Savannah River Plant(Geo).

The three streams studied are known to support 64 species of fish. One of the streams supports 55 of these. The abundance of fish, in both numbers and species, was high only in periods of reactor shutdown and not during thermal effluent flow. The fauna upstream from the thermal effluent was exceedingly depauperate in both numbers and species. Post-thermal streams rapidly recovered their fish diversity and abundance. (See also W77-05541) (Chilton-ORNL)
W77-05582

DISTRIBUTION AND ABUNDANCE OF FISH POPULATIONS IN THE MIDDLE WABASH RIVER,
DePauw Univ., Greencastle, Ind. Dept. of Zoology.
T. C. Teppen, and J. R. Gammon.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 272-283, 6 fig, 4 tab, 35 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Water quality, Fish populations, Biological communities, Heated water, Discharge(Water), *Indiana.

The study was conducted to determine effects of heated effluents as well as changes in water quality on ichtyofaunal communities. Among the community parameters measured, (number caught/km, weight in kilograms caught/km, number of species caught at each station, a Shannon-Weiner (S-W) diversity index based on numbers, and a S-W diversity based on weights) intersegmental differences were minor. Only the S-W diversities based on weights were uniform among sampling stations. This data indicated a lower diversity below Terre Haute. A greater abundance of fish was indicated above Cayuga generating station. Although species associations were variable among the segments, overall community parameters remained relatively unaffected. (See also W77-05541) (Chilton-ORNL)
W77-05583

SEASONAL DISTRIBUTION AND ABUNDANCE OF OHIO RIVER FISHES AT THE J. M. STUART ELECTRIC GENERATING STATION,
DePauw Univ., Greencastle, Ind. Dept. of Zoology.
C. O. Yoder, and J. R. Gammon.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 284-295, 7 fig, 2 tab, 39 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Seasonal, Fish populations, Number fish per acre, *Distribution, Powerplants, *Ohio River, Ohio, Kentucky.
Identifiers: Species diversity.

Samples were collected from 3 thermally elevated zones, 2 ambient river zones, and a backwater zone. Water temperatures varied from 6-40C in the heated zones, 4-30C in the ambient river zones, and 5-27C in the backwater zones. Most fish were eliminated from the effluent canal in summer and were most numerous in the backwater and ambient river zones. Density and biomass increased in all zones, except the effluent canal, with the advent of cooler temperatures and an abundance of forage species in fall. The reverse of summer events took place in winter. Near-freezing temperatures in the ambient river zones, as well as high summer temperatures in the effluent canal, limit the time fish can spend in these areas. (See also W77-05541) (Chilton-ORNL)
W77-05584

THE MACROBENTHIC COMMUNITY OF A THERMALLY ALTERED AREA OF TAMPA BAY, FLORIDA,
University of South Florida, St. Petersburg. Dept. of Marine Science.
N. J. Blake, L. J. Doyle, and T. E. Pyle.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 296-301, 8 fig, 2 tab, 11 ref.

Descriptors: *Environmental effects, *Thermal pollution, Discharge(Water), Population, Aquatic populations, Benthic fauna, Benthic flora, Temperature, Heated water, *Florida.
Identifiers: *Tampa Bay(Fla).

The results of visual observations were used to estimate the distribution of seagrasses in different areas adjacent to the powerplant. Three seagrasses, Thalassia testudinum, Syringodium filiforme, and Halodule wrightii were observed on the intake side of the plant but on the discharge side over 81 ha have been destroyed. An attempt was made to transplant Thalassia testudinum to the discharge area but it failed to survive for 30 when mean water temperature was 31C or greater. During the summer, a survey of benthic invertebrates on the intake side yielded a total of 104 species of polychaetes, molluscs, crustaceans, and echinoderms and only 60 species from the discharge side. (See also W77-05541) (Chilton-ORNL)
W77-05585

EFFECTS OF THERMAL CONSTANCY AND SEASONAL TEMPERATURE DISPLACEMENT ON COMMUNITY STRUCTURE OF STREAM MACROINVERTEBRATES,
Colorado State Univ., Fort Collins. Dept. of Zoology; and Colorado State Univ., Fort Collins. Dept. of Entomology.
J. V. Ward.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 302-307, 3 fig, 2 tab, 32 ref.

Descriptors: *Environmental effects, *Temperature, Dams, Dam construction, Population, Aquatic populations, Biological communities, *Seasonal, *Invertebrates, Reservoirs, *Colorado.
Identifiers: *South Platte River(Colo).

The study was conducted on the South Platte River below Cheesman Lake, a deep-release storage reservoir. Environmental conditions include diurnal and seasonal thermal constancy, a greatly delayed seasonal temperature maximum, and summer cool and winter warm. The favorable conditions were reflected by the presence of an abundant macroinvertebrate fauna at all sites during all seasons, however, the number of species increased progressively downstream concomitant with an approach toward more normal temperature conditions. Several hypotheses are presented to explain the low species diversity: reduction of niche overlap and a shift toward an equilibrium community as a result of reduced environmental fluctuation; more intense competition associated with greater productivity; elimination of maor invertebrate predatorss; and failure of the limited temperature range to provide optimal temperatures for various physiological processes. (See also W77-05541) (Chilton-ORNL)
W77-05586

THERMAL EFFLUENT IN COASTAL RIVERS: A CONTRIBUTION TO THE LOCATION OF POWER PLANTS,
University of South Florida, St. Petersburg. Dept. of Marine Science.
R. C. Baird, and J. A. Watson.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 308-315, 6 fig, 2 tab, 35 ref.

Descriptors: *Environmental effects, *Powerplants, Freshwater, Saline water, Interfaces, *Sites, Biological communities, *Thermal pollution, Rivers, *Georgia.
Identifiers: Savannah Front River(Geo).

The study was conducted at a power plant at Port Wentworth, on the Savannah Front River. The data indicated that the location of power plants with once-through cooling systems near the freshwater-saline boundary of a large river system may be environmentally acceptable. An important potential impact appears to involve plant-induced mortality at various life-history stages of anadromous fish species, particularly those which spawn near the interface region. Mortality of other elements of the biota appears not likely to significantly affect populations of balanced communities upstream and downstream. (See also W77-05541) (Chilton-ORNL)
W77-05587

AN ANALYSIS OF THE APPLICABILITY OF EPA'S DRAFT WATER-TEMPERATURE CRITERIA: A SITE-SPECIFIC CASE-HISTORY EVALUATION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
K. L. Dickson, J. Cairns, Jr., D. S. Cherry, and J. R. Stauffer.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 316-326, 9 fig, 1 tab, 36 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Water quality standards, Temperature, Fish, Catfish, Bass, *Virginia, Water temperature, Rivers.
Identifiers: *Water temperature criteria, *New River(VA).

The EPA's draft water-temperature criteria are applied to important representative fish species in New River, Virginia. Combined data on the criteria, fish preference and avoidance temperatures, field studies at the site, and the thermal plume distribution were used to make the assessment. No data on water-temperature criteria e available for some important fish species found at the site, but, for species for which data were available, the predicted impact was corroborated by the field studies. Channel catfish and smallmouth bass were the species about which significant conclusions could be made. (See also W77-05541) (Chilton-ORNL)
W77-05588

THE CONNECTICUT RIVER ECOLOGICAL STUDY: A SYNOPSIS,
Yale Univ., New Haven, Conn. Dept. of Biology.
D. Merriman.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 327-330, 1 fig, 5 ref.

Descriptors: *Environmental effects, *Thermal pollution, Fish populations, Fish, Benthic fauna, Water quality, Thermal stress, Ecology, *Connecticut River, Rivers.
Identifiers: Mechanical stress.

Included are a description of the plume, an examination of the anadromous shad population, a discussion of the affected ichthyofauna and entrainment, and an account of alterations in benthic fauna. The thermal discharge from the Connecticut Yankee generating plant does not appear to exceed the limits of acceptability as judged by any reasonable means. Alterations appear to be wrought by mechanical rather than thermal factors. (See also W77-05541) (Chilton-ORNL)
W77-05589

EFFECTS OF ENTRAINMENT THROUGH OCONEE NUCLEAR STATION ON CARBON-14 ASSIMILATION RATES OF PHYTOPLANKTON,
Duke Power Co., Charlotte, N.C. Environmental Sciences Unit.
T. V. Kreh, and J. E. Derwort.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 331-335, 3 tab, 1 fig, 12 ref.

Descriptors: *Environmental effects, *Entrainment, *Phytoplankton, Thermal pollution, Thermal stress, Productivity, Primary productivity, Photosynthesis, Nuclear powerplants, *South Carolina.
Identifiers: Assimilation rates, Oconee Nuclear Station(SC).

Thermal elevations and multiple entrainment stresses at Oconee Nuclear Station resulted in an average annual stimulation of carbon assimilation rates (20 and 11% respectively). The variability of replicate data precluded any value judgement of effects of entrainment on assimilation rates.

Damage to intake phytoplankton and changes in primary productivity were probably minimal when considered in the light of the short residence time in the cooling system followed by rapid mixing in the open lake and the relatively low productivity of the intake water. (See also W77-05541) (Chilton-ORNL)
W77-05590

INTERACTIVE EFFECTS OF TEMPERATURE, SALINITY, AND OTHER FACTORS ON COASTAL COPEPODS,
Florida Univ. at Marineland, St. Augustine. C. V. Whitney Marine Lab.
R. W. Alden, III, F. J. S. Maturo, Jr., and W. Ingram, III.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, georgia April 2-5, 1975. CONF-750425, 1976. p 336-348, 7 fig, 1 tab, 26 ref.

Descriptors: *Environmental effects, *Entrainment, *Thermal stress, *Copepods, Thermal pollution, *Temperature, *Salinity, Aquatic habitats.

The response of the various species of copepods to the effects of entrainment showed certain similarities and some individual differences. Temperature, salinity, and temperature-salinity interactions were the most important factors in determining the resistance of copepods to thermal stress. Data supported two conclusions relating to the basic reactions of the species: (1) Given that mechanical and thermal shock effects are unavoidable, power plants having prolonged delayed thermal effects will cause significantly increased mortality in entrained planktonic communities. (2) Estuarine copepods are preadapted to many of the stresses imposed by power plants and thus have a higher fitness than do coastal or pelagic forms. (See also W77-05541) (Chilton-ORNL)
W77-05591

ENTRAINMENT OF ESTUARINE ZOOPLANKTON INTO A MID-ATLANTIC POWER PLANT: DELAYED EFFECTS,
Johns Hopkins Univ., Baltimore, Md.
R. M. Davies, C. H. Hanson, and L. D. Jensen.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 349-357, 6 tab, 2 fig, 16 ref.

Descriptors: *Environmental effects, *Entrainment, *Zooplankton, Mortality, Powerplants, Discharge(Water), Laboratory tests, *Maryland, Chesapeake Bay.
Identifiers: *Delayed effects(Entrainment), Crane Power Plant(Md).

zooplankton were collected from the intake and discharge of the Crane Power Plant and were incubated under continuous-flow ambient and experimental conditions in netted containers. Adult survival appeared to be independent of population density, unaffected by intramolt mortality, and probably influenced little by predation with the experimental population. Analysis of adult survival indicated that there was no discernible effect of mechanical or thermal stress as a result of entrainment during cooler months when the discharge temperture was relatively low compared with the acute lethal temperature for estaurine zooplankton. (See also W77-05541) (Chilton-ORNL)
W77-05592

ASSESSMENT OF POWER-PLANT EFFECTS ON ZOOPLANKTON IN THE NEAR FIELD,
Martin Marietta Corp., Baltimore, Md. Environmental Technology Center.
T. T. Polgar, L. H. Bongers, and G. M. Krainak.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 358-367, 4 tab, 3 fig, 14 ref.

Descriptors: *Environmental effects, *Entrainment, *Zooplankton, *Mortality, Model studies, Discharge(Water), Population.

An entrainment model was used which took into account tidal recirculation, mixing, and once-through kill rate. From this model theoretical expressions were derived for ratios of densities of live organisms at the intake of a power plant to densities in the far field. Experimental data were compared with model results. From the model calculation using 100% once-through kill, it was estimated that the plant impacts 2% of the zooplankton population by entrainment damage. Large intake depletions of nauplii showed apparent effects in excess of those expected from entrainment alone. These near-field changes were attributed to avoidance reaction and to mortalities in the vicinity of the plant. (See also W77-05541) (Chilton-ORNL)
W77-05593

EFFECTS OF POWER-PLANT COOLING-WATER ENTRAINMENT ON THE DRIFTING MACROINVERTEBRATES OF THE WABASH RIVER (INDIANA),
DePauw Univ., Greencastle, Ind. Dept. of Zoology.
J. R. King, and E. R. Mancini.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 368-372, 1 fig, 2 tab, 19 ref.

Descriptors: *Environmental effects, *Entrainment, *Drifting(Aquatic), Benthos, *Invertebrates, Powerplants, Cooling water, *Indiana, Rivers.
Identifiers: *Wabash River(Ind).

Results indicated that tolerance of the rigors of entrainment varies among species and among members of the same species. Results also indicated that most organisms subject to entrainment are not distributed homogeneously in the water column. Distributional patterns of particular species change according to diel patterns. Large numbers of Baetis spp. and Stenonema spp. are killed while passing through the condenser cooling system. Baetis spp., Stenonema spp., and Hydropsyche spp. also showed deterioration of physical condition. This deterioration probably results from mechanical or pressure conditions experienced during entrainment. For most taxa differences in viability and physical condition between intake and discharge were greatest during periods of high discharge temperature. (See also W77-05541) (Chilton-ORNL)
W77-05594

AN EVALUATION OF THE IMPINGEMENT OF FISHES AT FOUR DUKE POWER COMPANY STEAM-GENERATING FACILITIES,
Duke Power Co., Charlotte, N.C. Environmental Sciences Unit.
T. J. Edwards, W. H. Hunt, L. E. Miller, and J. J. Sevic.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 373-380, 3 fig, 5 tab, 12 ref.

Descriptors: *Environmental effects, *Entrainment, *Intakes, Intakes structures, Fish, On-site investigations, Screens, Powerplants, Fish handling facilities.
Identifiers: Impingement.

Fish impingement data were collected at four generating facilities, representing river intake, epilimnetic reservoir intake, and skimmer-wall intake designs. Threadfin shad made up the majority of fish collected on intake screens. In all cases the number of fish species impinged at specific sites was fewer than the number collected during concurrent field investigations in the study area. Due to the susceptibility of threadfin shad to low temperature, relatively large numbers of fish were collected on intake screens during late fall or winter. Intake velocity did not appear to be a determining factor concerning relative rates of impingement among the sites discussed. Intake design, specifically the position of the intake structure relative to the cooling-water source, significantly affected impingement rates. Skimmer walls did not provide a deterrent to the impingement of fish. (See also W77-05541) (Chilton-ORNL)
W77-05595

PRELIMNARY ASSESSMENT OF LARVAL FISH ENTRAINMENT, COLBERT STEAM PLANT, TENNESSEE RIVER,
Tennessee Valley Authority, Muscle Shoals, Ala.
W. B. Wrenn.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 381-386, 3 tab, 1 fig, 23 ref.

Descriptors: *Environmental effects, *Entrainment, Fish, *Larvae, Mortality, Thermal stress, Resistance, *Tennessee River, Cooling water, Fish handling facilities, Tennessee.
Identifiers: Shad, Colbert Steam Plant(Tenn).

Cooling water at the Colbert Steam Plant is heated approximately 8C before being discharged into a channel which flows back into the river a distance of 1.6 km below the plant. During the period of the study (1972-1973) at least 13 species of fish larvae were entrained by the plant. The dominant species entrained were shad which appeared to be most vulnerable during May and June. On the basis of the thermal regime for this period and the thermal-resistance data for gizzard shad, it was concluded that even considering the additional 180 min. exposure in the creek, thermal resistance of the gizzard shad would not be exceeded. On the basis of these observation, even assuming 100% mortality of entrained fish, overall effects of entrainment appear to be insignificant since Colbert Steam Plant uses only an equivalent of 3% of the river flow. (See also W77-05541) (Chilton-ORNL)
W77-05596

THE INCIDENCE AND EFFECT OF ONCE-THROUGH COOLING ON YOUNG-OF-THE-YEAR FISHES AT LONG POINT BAY, LAKE ERIE: A PRELIMINARY ASSESSMENT,
Ontario Ministry of Natural Resources, Port Dover.
G. C. Teleki.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 387-393, 4 tab, 4 fig, 11 ref.

Descriptors: *Environmental effects, *Entrainment, Fish, Larvae, Thermal stress, Mortality, *Cooling water, Fish harvest, *Lake Erie, Canada.

Samples were collected in the forebay, outfall gates, and effluent channel of the Nanticoke Generating Station. At peak plant output, numbers of fish entrained ranged from 30,800 to 539,000/24 hr. This equals an hourly removal of 2.9% of the study area water and most of the organisms contained therein. Nine species were captured in all sample locations with the dominant species being smelt (Osmerus mordax). 1-3.7% of fish passing through the condenser system survived but, on the basis of the density of living smelt larvae in the forebay and effluent channel, 84% were eilled by the time they had reached the effluent channel. 49.5% of the total plant mortality was due to mechanical stress and 34.5% to condenser-passage shock. The impact of entrainment loss to the harvestable stock was calculated to be 43 tonnes annually. (See also W77-05541) (Chilton-ORNL)
W77-05597

SURVIVAL OF JUVENILE FISHES RECEIVING THERMAL AND MECHANICAL STRESSES IN A SIMULATED POWER-PLANT CONDENSER,
Oak Ridge National Lab., Tenn.

R. J. Kedl, and C. C. Coutant.
In: Thermal Ecology II, Proceedings of a Symposium held at Augusta, Georgia April 2-5, 1975. CONF-750425, 1976. p 394-400, 4 fig, 3 tab, 8 ref.

Descriptors: *Environmental effects, *Entrainment, *Thermal stress, Powerplants, Larvae, Fish, *Juvenile fish, Zooplankton, Bass, Sunfishes, Mortality, Daphnia.
Identifiers: Fluid-induced stress(Fish), Morane saxatilis, Lepomis macrochirus, Daphnia magna.

Data are presented for three species (Morone saxatilis, Lepomis macrochirus, and Daphnia magna) which were subjected to fluid-induced stresses. Fluid-induced stress was examined separately and in combination with thermal stress. At velocities up to 5.8m/sec, fluid-induced stresses were generally not fatal to larval fish. At velocities of 4.2m/sec, 10 to 30% mortality was observed for Daphnia magna. Combned thermal and fluid-induced stresses resulted in mortalities equal to those from thermal stress alone in Morone saxatilis. These experiments suggest minimal mortalities to the species tested when they were exposed to fluid-induced stresses generated in a condenser tube typical of that in a steam power plant. (See also W77-05541) (Chilton-ORNL)
W77-05598

5D. Waste Treatment Processes

THE REUSE OF WATER IN COMMERCIAL RAISING OF CATFISH - PHASE TWO,
Memphis State Univ., Tenn. Dept. of Biology.
B. A. Simco.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 217, Price codes: A04 in paper copy, A01 in microfiche. Tennessee Water Resources Research Center, Knoxville, Research Report No 52, December 1976. 65 p, 15 fig, 12 tab, 39 ref. OWRT B-031-Tenn(1). 14-31-0001-5115.

Descriptors: *Channel catfish, Fish management, *Water reuse, Fish diets, Fish reproduction, *Recirculated water, *Filters, Standing crops, Dissolved oxygen, Ammonia, Commercial fish, *Trickling filters.
Identifiers: *Biological filters.

Channel catfish were cultured at high densities in systems in which biological filters permitted the reuse of the water. Standing crops as high as 213 kg/m3 were obtained with maximum daily gains of 1.85 kg in systems with large filters and a rapid exchange of water through the fish tanks. Dissolved oxygen and ammonia were the primary limiting factors in growth studies in which fish were raised from fingerling to eating-size fish. Ammonia production by unfed fish did not vary within a 24-hour period and averaged 3.06 mg NH3/kg/hour. Following feedings, 0.02 kg NH3 was produced per kilogram of food. Treatment of biological filters with commonly used paraciticides and antibacterial agents did not drastically alter biological filter effectiveness. Much of the organic material in closed systems is found in foam, solids and fish food. With increased costs for power, recirculating systems can not seemingly compete equally with the established methods of culturing catfish in open ponds. (See also W74-12203)
W77-05103

MEASUREMENT AND FORMS OF NITROGEN AND PHOSPHOROUS,
Federal Water Quality Administration, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5A.
W77-05169

ECONOMICS OF DRY-WET COOLING TOWERS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II, V. C. Patel, and M-S. Cheng.
Journal of the Power Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. PO2, Proceedings paper No. 12515, p 147-163, November 1976. 5 fig, 4 equ, 36 ref. OWRT C-4071(No. 9015)(2), C-6011(No. 5201)(1).

Descriptors: *Cooling towers, *Economics, *Powerplants, Energy, Management, Operations, Water costs, Equations, Model studies, Systems analysis, Optimization, Design, Thermal pollution, Waste water treatment.
Identifiers: *Cooling systems, Power, *Thermoelectric power generation, *Water consumption, Cost minimization, Fogging.

Contemporary dry-wet design efforts and economic studies are reviewed and promising configurations are delineated. The basic accounting scheme and all relevant parameters necessary for comprehensive total cost calculations are identified and associated with typical values. Existing thermodynamic and psychrometric models for dry towers, wet towers, turbines, and condensers are then combined with the economic information to derive the total economies of various dry-wet tower configurations. Example comprehensive results for four parallel air-path and one series air-path cooling tower are included. It appears that parallel air-path configurations offer the most economical design for a dry-wet tower; dry-wet cooling towers also appear economically competitive with wet towers in some areas with high water costs. (Bell-Cornell)
W77-05191

OPTIMAL DESIGN OF MULTILEVEL BRANCHING SEWER SYSTEMS,
Texas Univ. at Austin. Dept. of Civil Engineering.
L. W. Mays, and H. G. Wenzel, Jr.
Water Resources Research, Vol. 12, No. 5, p 913-917, October 1976. 2 fig, 1 tab, 6 ref. OWRT C-4123(No. 9023)(9).

Descriptors: *Water resources, *Sewers, *Dynamic programming, Networks, Optimization, Pipes, Storm drains, Algorithms, Equations, Mathematical models, Systems analysis.
Identifiers: *Cost minimization, *Branched sewer systems, Cost design, Serial approach, Nonserial approach.

The problem of determining a minimum cost design of a multilevel branching storm sewer system is formulated by using a serial approach to describing the system and proceeding through the computational algorithm. Discrete differential dynamic programming (DDDP) is the basic search technique employed. Results for an example using the serial approach are compared to those achieved by using an earlier nonserial DDDP approach. The several advantages of the serial approach become increasingly important as the size and level of branching of the system increase. These advantages are outlined and discussed, the superiority of the serial over the nonserial approach being demonstrated. (Bell-Cornell)
W77-05192

MODEL FOR LAYOUT AND DESIGN OF SEWER SYSTEMS,
Texas Univ. at Austin. Dept. of Civil Engineering.
L. W. Mays, H. G. Wenzel, Jr., and J. C. Liebman.
Journal of the Water Resources Planning and Management Division, Proceedings of ASCE, Vol. 102, No. WR2, p 385-405, November, 1976. 7 fig, 1 tab, 24 ref. OWRT C-4123(No. 9023)(10).

Descriptors: *Mathematical models, *Sewers, Cost-benefit analysis, *Model studies, *Drainage systems, Hydraulic structures, Conveyance structures, Computer models, Computer programs, *Optimization, Costs.
Identifiers: *Cost minimization.

A heuristic optimization model for simultaneously determining minimum cost layouts and designs of sewer systems is described. The heuristic optimization model is developed as a screening model consisting of two conjunctive phases: a combined layout and design model and a design model for given layouts. The combined layout and design model is an optimization procedure which uses a connectivity model for selecting the least-cost network configuration from a finite set of alternatives for each stage. The model for given layouts is used to compute the optimal design of the layouts generated in the combined model. The screening model can be efficiently used for large-scale sewer systems and can be extended for storm sewer design to include risk considerations. Computer storage requirements for large-scale systems are relatively small so that slow core memory is not needed. Approximately 268k bytes of storage are required for a system of 200 manholes. (Kreager-FIRL)
W77-05195

EVALUATION OF METALS IN WASTEWATER SLUDGE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W77-05197

ACID MINE DRAINAGE TREATMENT WITH THE ROTATING BIOLOGICAL CONTACTOR,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
H. Olem, and R. F. Unz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 289, Price codes: A05 in paper copy, A01 in microfiche. Research Publication Number 93, Institute for Research on Land and Water Resources, University, Park, Pennsylvania, September 1976. 70 p, 11 tab, 22 fig, 62 ref, 2 append. OWRT A-034-PA(2). 14-31-0001-5038.

Descriptors: *Oxidation, *Mine water, Acidic water, Coal mine wastes, *Mine drainage, Iron, Limestone, Neutralization, Waste water treatment, *Biological treatment, Water pollution treatment.
Identifiers: *Biochemical ferrous iron oxidation, *Disc rotation, *Iron oxidation, *Coal mine drainage, *Rotating biological contactor, Ferrous iron, Limestone neutralization.

Pilot scale testing of the rotating biological contactor for the oxidation of ferrous iron in acid coal mine drainage has shown the process to be dependable, efficient, and economically comparable to purely chemical methods of iron oxidation. The 0.5 meter device consisted of four sets of plastic discs affixed to a centralized shaft. As the discs rotated half immersed in flowing mine water, an average iron-oxidizing bacterial population of 7x10 to the fourth power cells per sq cm colonized the disc surfaces. Over 90 percent oxidation of influent ferrous iron was accomplished in two weeks following start up without prior bacterial preceeding or nutrient supplementation. Concentration dependent first order kinetics were established during continuous operation from May 1974 through May 1975 at several hydraulic loadings and disc rotation rates. Hydraulic loadings of 2.7 and 5.4 gpd/sq ft at optimum disc rotation resulted in the transformation of an average 240 mg/l influent ferrous iron to produce effluents of 2 and 5 mg/l, respectively. Performance was not impaired when operated at mine water temperatures as low as 8C and the process was shown to recover rapidly when subjected to artificially induced toxicity in the form of a strong disinfectant solution. The process prepared a coal mine drainage containing up to 313 mg/l of ferrous iron for limestone neutralization and subsequent solids precipitation at an estimated operating cost of $0.04 per thousand gallons. Two procedures were outlined to assist sizing full scale systems for mine water biochemical ferrous iron oxidation. (Sink-Penn State)

W77-05210

PROBLEMS AND POSSIBILITIES IN URBAN DRAINAGE,
Nova Scotia Technical Coll., Halifax. Dept. of Civil Engineering.
D. H. Waller.
Canadian Journal of Civil Engineering, Vol. 3, No. 3, p 392-401, September 1976. 4 tab, 31 ref.

Descriptors: *Urban drainage, *Water quality control, *Canada, Runoff, Storm water, Sewage treatment, Treatment facilities, Diversion, Control, Storage, Mathematical models.
Identifiers: Developing areas, Developed areas, Remote monitoring, Remote control, Flushing, Separation.

Urban drainage problems in Canada will grow with increasing urbanization. In developing areas, problems are related to increased volumes and rates of surface runoff; problems in developed areas are overloaded sewerage systems, combined sewer overflows, and urban surface water pollution. Research and demonstration programs in Canada and the United States are examining potential solutions to these problems. Rate and volume of storm water may be controlled by diversion of unwanted water or by storage. Controls on quantity include source controls, combined sewerage system modifications and operational changes, and treatment methods. Urban drainage models can simulate system behavior and evaluate performance of alternative solutions. The three most generally useful models are STORM, Storm Water Management Model (SWMM), and the Illinois Urban Drainage Area Simulatir (ILLUDAS). Development and application of models may be the most significant single result of urban drainage research and demonstration activities. (Bell-Cornell)
W77-05248

NATURAL METHODS OF PURIFYING WASTE WATERS AND UTILIZING THEM IN AGRICULTURE, BIBLIOGRAPHY, PARTS 1 AND 2,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 5G.
W77-05306

ALGAL COMPETITION IN AN EPILITHIC RIVER FLORA,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W77-05314

WETTED AREA, SLIME THICKNESS AND LIQUID PHASE MASS TRANSFER IN PACKED BED BIOLOGICAL FILM REACTORS,
University of Manchester Inst. of Science and Technology (England). Dept. of Chemical Engineering.
B. Atkinson, and M. E. A. R. Ali.
Transactions of the Institution of Chemical Engineers, Vol. 54, No. 4, p 239-250, October, 1976. 16 fig, 9 tab, 18 ref.

Descriptors: Filtration, *Biological treatment, Microbial degradation, *Waste water treatment, Trickling filters, Sewage treatment, Industrial wastes, Domestic wastes, Biochemical oxygen demand, Filters, Model studies, Microorganisms.

Trickling filters or packed-bed biological film reactors are inserted between sedimentation tanks in systems for biological purification of domestic and industrial waste water. The performance of one such reactor containing Biopac high-porosity plastic packing and washed 'clean' each day with a high pressure water hose was examined. The biological film was composed of a mixed culture of microorganisms with glucose as the sole limiting substrate. The biological film thickness and the efficiency of substrate removal were satisfactorily consistent. Throughout the experiment, the biological film thickness remained uniform, as confirmed by the fact that independent parameters fitting the experimental data at different flow rates, using two different optimization methods, gave similar biological film thickness values. The experimental data were well represented by a mathematical model in which liquid phase mass transfer was interpreted as involving a mass transfer coefficient. The values of the mass transfer coefficients obtained for all flow rates investigated were very high. Thus all the parameters of a packed bed biological film reactor can be obtained from a pilot plant investigation and an estimation of the kinetic coefficients. The design requirements for any microbe/substrate system are reduced to a knowledge of the kinetic coefficients in trickling filters with controlled microbial hold-up. (Collins-FIRL)
W77-05315

PLANT UPGRADED WITH ROTATING BIOLOGICAL SURFACE SYSTEM,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Ricc Div.
S. E. J. Mather.
Public Works, Vol. 108, No. 1, p 59-60, January, 1977.

Descriptors: *Sewage treatment, *Sewerage, *Treatment facilities, *Waste water treatment, *Biochemical oxygen demand, Biological treatment, Biodegradation, Sludge.
Identifiers: *Bio-Surf.

The Newell Company of Newell, West Virginia has planned the addition of a rotating biological surface sysem to its existing primary sewage treatment facility. This was required to meet EPA standards of a 95% BOD reduction, suspended solids and phosphorus removal. The added unit, Bio-Surf, consists of a series of 12-foot diameter high density polyethylene sheets in corrugated sections for maximum surface area for microbial growth. There are two 25-foot shafts with a total of 176,000 aq ft, divided into four stages. Flow is parallel to the shaft and perpendicular to the medium. Clarified primary effluent enters the Bio-Surf unit where fixed aerobic microbial cultures remove dissolved and suspended organic matter from the water. Each stage is a completely mixed, fixed-film biological reactor with a dynamic equilibrium between the biological growth rate and the sloughing rate of the bio-mass. The degree of treatment is increased, as waste water and sloughed bio-mass progress from stage to stage, by biological culture adapted to the changing waste water. Bio-Surf section effluent is not recirculated and operating power requirements are minimal. Excess waste water and bio-mass from the last treatment stage enter circular secondary clarifiers at the tank periphery and clarified effluent is drawn out over weirs at the center. Sludge and skimmings can be returned to the sluge digester or to the inlet end of existing primary settling tanks. After drying, digested sludge is removed by truck to landfill or dumping. The clarified effluent is discharged into a chlorine contact tank with final effluent discharged into the Ohio River. (Collins-FIRL)
W77-05316

ANAEROBIC DIGESTER SUPERNATANT DOES NOT HAVE TO BE A PROBLEM,
Envirex, Inc., Milwaukee, Wis.
N. A. Mignone.
Water and Sewage Works, Vol. 123, No. 12, p 57-59, December, 1976. 8 tab, 26 ref.

Descriptors: *Anaerobic digestion, *Sludge treatment, Waste water treatment, Digestion tanks, Suspended solids, Municipal wastes, Trickling filters, Metals, Phosphorus, Lime, Chlorides, Sludge, Temperature, Odor, Color.
Identifiers: *Alum, Supernatant.

The problem of poor quality supernatant from anaerobic digestion is discussed in the first of a 3-part series. This was defined as many liquid flow from either a single-stage or two-stage anaerobic digester which is not scum, gas, or liquid pumped from the bottom half of the digestion tank. Its color varies from clear to yellow, to black; and the odor can be pleasant to nauseating. Quality and quantity of supernatant depends on the character of solids, the type of solids and the digester design (temperature, loading, and mixing). Total solids increases with the fineness of division of suspended solids removed during treatment. The three most common municipal sludges handled are primary, primary with waste activated, and primary plus trickling filter. Recent concern with phosphorus removal has created sludge with high proportions of chemicals. The effects of chemical sludge on anaerobic digestion and the release of phosphate and metal ions into the supernatant are of great concern. Several studes of primary plus waste activated sludge with two stage, mesophilic, anaerobic digestion with hydratd lime, aluminum sulfate, ferric chloride, and sodium aluminate for phosphorus removal show no effects on the anaerobic digestion process and release of soluble phosphorus was minimal. Treatment by a single stage, mesophilic, anaerobic digestr treating primary sludge with ferric chloride, primary sludge with lime, primary sludge with alum, and primary plus trickling filter with alum, produced similar results. (Collins-FIRL)
W77-05317

MILTON KEYNES SEWERAGE SYSTEM OPENED,
Water Services, Vol. 80, No. 969, p 688-689, November, 1976.

Descriptors: *Sewerage, *Tunnels, *Piping sytems(Mechanical), Pipes, Separated sewers, Tunneling, Tunnel design, Soil types.
Identifiers: *Milton Keynes sewerage system(England).

The piping system of the Milton Keynes, England, city sewerage scheme was described. Consulting engineers made recommendations as to the general requirements and approximate routes for trunk sewers. Separate sewerage systems are provided for foul and surface water sewage. Trunk sewers were built along the lines of grid roads to avoid interference with development areas and the two sets of sewers were built in twin parallel trenches where possible. The necessity for a single trench was small. The foul trunk sewer was made of bolted ring, smooth bore ring, and reinforced flexibly jointed pipe layed in open cut. The other sytem used reinforced concrete pipes and internal segmental tunnel associated segmental shafts, manholes and outfall bays for foul and surface water drainage. The central contract was for reinforced concrete pipe in open cut a depths up to 7 meters. Construction involved pipes in open trench, pipe-jacking, heading, segmental tunnelling and box culvert. Manholes were constructed in precast concrete rings, segmental concrete rings and in-situ concrete. Close-piled coffer dam construction and well-point dewatering wre often used. Where river crossing was involved, tunnel, pipe jack, coffer dam, and open cut methods were employed. Ground conditions varied from hard rock to running sand and silt, and the major soil is Oxford Clay. Special trench supporting boxes were designed for use in open cut construction. (Collins-FIRL)
W77-05318

OUTFALL HAS UNUSUAL ADMINISTRATION, REGIONAL PLAN IS SERVING NEW JERSEY,
Killam (Elson T.) Associates, Inc., Milburn, N. J.
For primary bibliographic entry see Field 5E.
W77-05319

AN EXPERIMENTAL AND SIMULATION STUDY OF WASTE EFFLUENT FILTRATION THROUGH SOIL,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5B.
W77-05321

A DYNAMIC MODEL AND COMPUTER COMPATIBLE CONTROL STRATEGIES FOR WASTE WATER TREATMENT PLANTS,
Clemson Univ., S.C.
M. K. Stenstrom.
Available from University Microfilms, Inc., Ann Arbor, Michigan, Order No. 76-23,043. Ph.D. Thesis, 1976, 324 p.

Descriptors: *Automatic control, *Activated sludge, *Analytical techniques, *Treatment facilities, *Model studies, *Waste water treatment, Sludge treatment, Economics.

A model was developed for the use of automatic controls as a method for instituting economies in the operation of treatment plants. Automatic controls could improve the efficiency and performance of most components of a treatment system. Six process models were developed: primary clarification, activated sludge with secondary clarification-thickening, waste sludge thickening, anaerobic digestion, and chlorine disinfection. The latter two models were used to predict end products and the liquid and solids processing trains. Controls were developed for all processes and the total plant was simulated using time-varying deterministic and stochastic inputs. Definite economic optimum sludge ages were indicated which depend upon costs for energy and ultimate sludge disposal. (Collins-FIRL)
W77-05322

THE OPTIMIZATION OF CHEMICAL PRECIPITATION: FLOCCULATION OF MUNICIPAL WASTE WATERS,
California Univ., Berkeley.
F-M. Lee.
Available from University Microfilms, Inc., Ann Arbor, Michigan, Order No. 76-15275. Ph.D. Thesis, 1975, 181 p.

Descriptors: *Chemical precipitation, *Flocculation, *Domestic wastes, *Waste water treatment, *Sewage treatment, Turbidity, Suspended solids, Phosphorus, Nitrogen, Coagulation, Pilot plants, Lime, *Optimization.

A study was conducted to investigate means of optimizing the chemical precipitation-flocculation phase in the treatment of domestic raw waste water. Parameters of investigation were the removal of turbidity, suspended solids, organic matter, phosphorus, and nitrogen. Jar tests and a 2 gallon per minute continuous flow pilot plant were used for evaluation. Of the coagulants which had the highest removal efficiency of organics, suspended solids, total phosphate and organic nitrogen, lime gave the better effluent quality. It was also the most economical chemical for treating the raw waste water. The lime treatment of raw domestic sewage thus became the major thrust of testing. Process modifications and the kinetics of lime dissolution in water of various chemical composition and in various waste waters were studied. (Collins-FIRL)
W77-05324

SORPTION OF POLIOVIRUS FROM AQUEOUS SOLUTION WITH ACTIVE CARBON,
Michigan Univ., Ann Arbor.
R. H. Carlson.
Available from University Microfilms, Inc., Ann Arbor, Michigan, Order No. 76-19,098. Phd Thesis, 1976, 106 p.

Descriptors: *Viruses, *Activated carbon, Toxicity, Sewage treatment, Sewage effluent, Hydrogen ion concentration, Absorption, Sorption, *Waste water treatment.
Identifiers: *Poliovirus, Enteroviruses.

The use of activated carbon for removal of enteroviruses from raw domestic sewage was examined. The Mahoney strain of Type I poliovirus was used for testing. A qualitative plaque assay using HeLa cell monolayers in a double overlay technique was employed. Secondary sewage effluent components seemed to lower carbon capacity and toxic factors prevented a quantitative evaluation of the amount of inhibition. Poliovirus adsorption was influenced by physical factors such as the size of the carbon particles used. There was a direct relationship between rapid virus titer losses at acidic pH values in the absence of carbon absorbent and the pH value of the suspending solution. It is a function of the net charge on the particle. This pH-specific factor may have resulted in the misunderstanding of recently published virus adsorption studies. (Collins-FIRL)
W77-05325

AEROBIC BIOLOGICAL TREATMENT OF A COLLOIDAL WASTEWATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
H. A. Khararjian.
Available from University Microfilms, Inc., Ann Arbor, Michigan, Order No. 76-23,221. PhD Thesis, 1976, 137 p.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Chemical oxygen demand, *Aerobic treatment, *Colloids, Waste water(Pollution), Stabilization.

Contact stabilization was studied as a modification of the activated sludge process. Colloidal waste water made from yogurt, beef extract, and mineral salts was used in the study. Batch type experiments conducted at 0, 23, 43, and 54% colloidal percentages showed that not all colloidal wastes undergo a period of adsorption onto biological floc followed by release back into solution. Continuous flow experiments conducted on two model treatment units showed that the completely mixed and contact stabilization processes both have similar COD removal efficiencies when compared on a total sludge basis. Sludge productions in the contact stabilization processes were lower than in the completely mixed system. A mathematical model was developed for the use of design engineers and plant operators for use in process optimization. (Miller-FIRL)
W77-05326

DEVELOPMENT OF MATHEMATICAL MODELS FOR THE WATER QUALITY MANAGEMENT OF THE PEARL RIVER, JACKSON, MISSISSIPPI,
Purdue Univ., Lafayette, Ind.
P. T-C. Sun.
Available from University Microfilms, Inc., Ann Arbor, Michigan, Order No. 76-7143. PhD Thesis, 1975, 178 p.

Descriptors: *Sewage treatment, *Activated sludge, *Dissolved oxygen analyzers, Rivers, *Chlorination, *Nitrification, *Oxidation, *Mathematical models, Treatment facilities, *Waste water treatment, Kinetics, Ammonia, Water quality control.
Identifiers: Jackson(Miss), Contact stabilization, *Pearl River(Miss).

A mathematical model was developed to evaluate the waste treatment practice of organic removal and/or ammonia oxidation to avoid extreme dissolved oxygen deficits in the receiving stream. Two systems were studied. The first was a completely mixed activated sludge treatment plant which discharged into a hypothetical stream. The second involved the Jackson Mississippi Wastewater Treatment Plant, with a 'contact stabilization' activated sludge system, and the Pearl River, its receiving stream. Models were developed for organic removal, nitrification, and solids separation processes. Nitrification models were developed for the two types of activated sludge systems. A model was worked out for predicting effects of effluent on receiving streams. This employed Monod growth kinetics for heterotrophic carbon oxidation and autotrophic nitrification to determine stream dissolved oxygen resources. The combined models of the treatment plant and its receiving stream can further aid evaluation of the total operation. Results of studies showed that complete nitrification in the treatment system best protected oxygen resources for a stream receiving effluent from a completely mixed activated sludge treatment plant. For a contact stabilization system, partial nitrification may cause a more severe dissolved oxygen deficit than a non-nitrified effluent (short sludge age). Dissolved oxygen resources can be improved by chlorinating a partially nitrified effluent from a waste water treatment plant. (Collins-FIRL)
W77-05327

A MATHEMATICAL MODEL FOR PREDICTING WATER DEMAND, WASTE WATER DISPOSAL AND COST OF WATER AND WASTE WATER TREATMENT SYSTEMS IN DEVELOPING COUNTRIES,
Oklahoma Univ., Norman.
M. I. Muiga.
Available from University Microfilms, Inc., Ann Arbor, Michigan, Order No. 76-15,818.

Descriptors: *Mathematical models, *Cost analysis, *Water treatment, *Waste water treatment, Filters, Lagoons, Activated sludge, Trickling filters, Water supply, Waste water disposal, Foreign countries.
Identifiers: Sand filters.

Mathematical models were developed for various inputs and costs of water and waste water treatment for Africa, Asia, and Latin America. Such factors as water demand, waste water amounts, and construction, operation and maintenance costs of slow sand filter, rapid sand filter, stabilization lagoon, aerated lagoon, activated sludge, and trickling filter processes were considered. Analysis indicated that water demand is a function of population, income, and the percentage of households connected to water supply. Waste water disposal was shown to be a function of water demand, the percentage of homes connected to public sewage systems and the percentage of household systems. Equations for predicting water treatment costs were a function of the percentage cost of imported water supply materials, population, and design capacity. These variables gave the best correlation for waste water treatment costs. (Collins-FIRL)
W77-05328

ENGINEERING, SANITARY AND MUNICIPAL MODELING, IDENTIFICATION AND CONTROL OF A DYNAMIC AND STOCHASTIC CHEMICAL BIOLOGICAL PROCESS,
Wisconsin Univ.-Madison.
S. O. Adeyemi.
Available from University Microfilms, Inc., Ann Arbor, Michigan, Order No. 76-15, 979. PhD Thesis, 1976, 424 p.

Descriptors: *Model studies, *Systems analysis, Phosphorus, Chemical precipitation, Biological treatment, Operating costs, Mathematical models, Treatment facilities, *Waste water treatment, Pollutant identification.
Identifiers: *Phosphorus removal, Dynamic Data System(DDS).

The proposal that chemical cost savings and reduced effluent phosphorus variability may result from optimal control of a chemical-biological process was investigated. Phosphorus removal in-

volves simultaneous physical, chemical, and biological mechanisms. In this study, the operating data suggest the model form. The Dynamic Data System (DDS) which uses time series techniques to determine models is used. The DDS approach involves two model classes; scalar and vector. The objective was to develop models to aid performance improvement. Individual operating parameters which provide information on phosphorus removal performance were modeled. An input-output model was developed to define the functional relationships of these parameters. An optimal control strategy and sampling program based on the DDS models was developed. From these models, control equations were delineated for calculating the rate of iron addition. The total phosphorus system and total soluble phosphorus systems were defined. It was found that a significant amount of useful information is contained in the operating data from treatment facilities when proper techniques are used and that the DDS approach is a valuable tool for systems analysis and control. (Collins-FIRL)
W77-05330

TREATMENT OF LEACHATES FROM SANITARY LANDFILLS,
Washington Univ., Seattle.
O. J. G. Johansen.
Available from University Microfilms, Inc., Ann Arbor, Michigan, Order No. 76-17, 518. PhD Thesis, 1975, 396 p.

Descriptors: *Organic compounds, *Leachate, *Landfills, *Inorganic compounds, *Waste water treatment, Aerobic treatment, Anaerobic digestion, Activated sludge, Activated carbon, Biodegradation.

The fate of organics, heavy metals, and other inorganic compounds were evaluated in leachates from eight landfills. Leachates from two landfills were treated anaerobically and four aerobically to study biological treatability. Results from anaerobic tests indicated that treatment could be successful with organic loadings less than 0.7 kg COD/cu m/day and temperatures higher than 22C. The activated sludge process gave the best results of the aerobic systems. High strength leachates gave higher organic removals than low strength leachates. Treatment efficiencies were the same in treating both chemically precipitated or raw leachate. Phosphorus did not limit biodegradation. Concentrations of 50 milligrams per liter of zinc and copper proved inhibitory to COD removal. At temperatures below 18C, COD removals and nitrification dropped sharply. Chemical precipitation at high pH efficiently removed heavy metals from raw leachate. Activated carbon adsorption of biologically treated plus precipitated leachate produced much lower residual organics than carbon adsorption of precipitated leachate. (Collins-FIRL)
W77-05331

ACTIVATED CARBON ADSORPTION IN MUNICIPAL WASTE WATER TREATMENT AND REUSE SYSTEMS,
Washington Univ., Seattle.
D. K. Chow.
Available from University Microfilms, Inc., Ann Arbor, Michigan, Order No. 76-17, 431. PhD Thesis, 1975, 199 p.

Descriptors: *Activated carbon, *Adsorption, *Tertiary treatment, *Water reuse, *Waste water treatment, Effluents, *Municipal wastes, Analytical techniques, Organic compounds, Inorganic compounds, Pollutant identification.

Activated carbon adsorption was investigated as a tertiary treatment in waste water treatment and reuse systems. Resistant compounds and the breakthrough characteristics of carbon adsorption in fixed beds were analyzed to provide data on the design and use of adsorption units. Fixed activated carbon beds were used to treat biological and chemical secondary effluents of municipal sewage. Several physical and chemical analytical techniques were used to classify organic and inorganic compounds. Breakthrough data was gathered for resistant compounds which were recycled to the carbon beds, and for those which are not. Characteristics such as breakpoint time and adsorptive capacity were examined. Organic compounds (chlorinated hydrocarbons, aliphatic acids, aromatic amines and phenolic compounds, and inorganic sodium and calcium salts) are resistant compounds. Most of them are small molecules and biodegradable. A method is offered to predict maximum buildup levels of these compounds and the number of recycles of treated water needs to achieve these levels. An empirical approach for the prediction of breakthrough curves for fixed carbon beds in secondary effluent treatment is presented.(Collins-FIRL)
W77-05332

RECYCLING AGRICULTURAL RUNOFF,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
P. N. Walker, and W. D. Lembke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 578, Price codes: A05 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 119, January 1977, 88 p, 11 fig, 6 tab, 72 ref. OWRT A-077-ILL(1), 14-31-0001-6014.

Descriptors: *Irrigation, *Water reuse, Farm ponds, *Impervious soils, Computer models, Clays, *Illinois, *Recycling, *Agricultural runoff, Crop production, Drainage, Costs, Economics.
Identifiers: Claypan soils, Sandy soils.

The recycling agricultural runoff concept is the storage of excess water from agricultural land and using this water for irrigation of the same land when moisture supplies are low. Coincidentally, the system also recycles pesticides and nutrients, keeping them out of other parts of the environment. The claypan soils of Illinois appear to be best suited for water recycling when surface storage is used. Sandy soils are best suited to interstitial water storage. A review and analysis of literature on irrigation, drainage, reservoirs, pesticides, and nutrients, as it pertains to a recycling system is presented. Nutrient and pesticide recycling result in negligible cost or benefits to agricultural crops. There was insufficient information to determine the economic benefit to the environment of this recycling. A model was developed relating irrigation and drainage to crop yield using intermediate variables of soil moisture and air temperature. The model predicted that an acre-ft. of storage would be required per acre of irrigated watershed. The model was not successful at predicting the increase in yield resulting from irrigation and/or drainage. An example economic analysis reveals that under present conditions recycling agricultural runoff is not economically justifiable as a general practice in the claypan region of Illinois.
W77-05333

BIOCHEMICAL REACTOR ANALYSIS,
Rutgers - The State Univ., New Brunswick, N.J. Coll. of Engineering.
R. C. Ahlert, and B. Sharma.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 496, Price codes: A02 in paper copy, A01 in microfiche. New Jersey Water Resources Research Institute, New Brunswick, Completion Report, January 1977, 8 p. OWRT A-037-NJ(2). 14-31-0001-5030.

Descriptors: Water pollution effects, Water pollution sources, *Waste water treatment, Ecology, Biological communities, *Nitrification, *Nitrates, Nutrients, Nitrogen compounds, *Tertiary treatment, Cycling nutrients, Nitrites, *Oxidation, Mathematical models.
Identifiers: *Biochemical reactor analysis, Nitrifying bacteria, *Nitrite oxidation.

A nitrifying culture was developed in a continuous stirred tank reactor system, fed with a pure mineral salts medium containing no carbon. A distinguishing feature of the reactor was the preference of the nitrifying bacteria for available surfaces, expressed in the form of a biofilm. A mathematical model for nitrifier growth and activity was formulated for the system. Satisfactory nitrogen material balances were a problem. Assays for ammonia-N and nitrite-N were acceptable, but nitrate-N presented difficulties. Several methods were evaluated; a modification of the Brucine Method and/or the Ion Selective Electrode technique proved acceptable. The relative activity of attached and suspended nitrifying bacteria was studied in the CSTBR. Survival of nitrifiers in the reactor, under adverse fluctuations in environment, as well as responses to step-up and step-down changes in pH and ammonia-N feed concentration were studied. The response of nitrifiers to nitrite-N impulses were examined, also. Experimental data showed a step-down change in system pH results in inhibition of ammonia oxidation, while it appears to stimulate nitrite oxidation. A step-change in pH inhibits nitrite oxidation. Experimental data indicated ammonia oxidation proceeded preferentially in the attached phase, while nitrate formation from nitrite seemed to be favored in the suspended phase.
W77-05334

ENZYME PROCESS DESIGN FOR WATER TREATMENT,
Louisiana State Univ., Baton Rouge. Dept. of Chemical Engineering.
S. W. Johnston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 504, Price codes: A06 in paper copy, A01 in microfiche. M. S. Thesis, December 1976. 95 p, 31 fig, 4 tab, 33 ref, 3 append. OWRR A-036-LA(2). 14-34-0001-6019.

Descriptors: *Ion exchange, *Waste water treatment, Enzymes, Design criteria, Industrial wastes.
Identifiers: *Enzyme process design, Sugar mill waste water, *Sucrose removal.

Sucrose is often found in low concentrations in sugar mill waste water. In natural waterways, such wastes degrade water quality; bacterial growth prompted by the sugar removes dissolved oxygen. This work examines one phase of a proposed process to remove sucrose from waste water. Boric acid is known to form acidic complexes with certain compounds containing adjacent hydroxyl groups. If boric acid would react with sucrose a complex would from that could be removed by ion exchange. For the process to work, sucrose must be converted to glucose and fructose by enzmatic hydrolysis with invertase. First the free enzymatic hydrolysis was examined, then adsorption tests were run on the following materials: (1) activated charcoal, (2) Amberlite ion-exchange resin (IR-120, (3) Amberlite ion-exchange resin (IRC-50) activated alumina. Then the properties of the covalently bound enzyme were examined on the following supports: (1) resorcinol resin, (2) glutaraldehyde-treated resorcinol resin, (3) tannic acid resin, (4) glutaraldehyde-treated tannic acid resin, (5) Duolite ES-762 resin,l(6) glutaraldehyde-treated Duolite ES-762, (7) Amberlite IRC-50 ion-exchange resin, (8) polystyrene beads, (9) poly (styrene-divinylbenzene) Copolymer beads, (10) yeast-collagen material. Duolite was examined further under simulated industrial conditions, then iodine-treated invertase was immobilized on Duolite ES-762 and also tested. The iodine treatment greatly improved enzyme activity and performance. The prospects of using any of these enzyme systems were found to be rathr poor for the proposed industrial process due to economic and/or environmental constraints.
W77-05336

THE ROTATING BIOLOGICAL CONTACTOR FOR BIOCHEMICAL FERROUS IRON OXIDATION IN THE TREATMENT OF COAL MINE DRAINAGE,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
H. Olem.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 534, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis. November 1975. 75 p, 9 tab, 17 fig, 62 ref, 2 append. OWRT A-034-PA(1). 14-31-0001-5038

Descriptors: *Acid mine water, Coal mines, Coal mine wastes, Cost analysis, Pilot plants, Kinetics, Microbial degradation, Oxidation, Iron bacteria, Microorganisms, Industrial wastes, Water pollution control, *Waste water treatment, Operating costs.
Identifiers: *Ferrous iron, *Rotating biological contactor, Rotating disc process.

Pilot scale testing of the rotating biological contactor for the oxidationg of ferrous iron in acid coal mine drainage had shown the process to be dependable, efficient, and economically comparable to purely chemical methods of iron oxidation. The 0.5 meter device consisted of four sets of plastic discs affixed to a centralized shaft. As the discs rotated half immersed in flowing mine water, an average iron-oxidizing bacterial population of 70,000 cells per sq cm colonized the disc surfaces without prior bacterial preseeding or nutrient supplementation. Concentration dependent first order kinetics were established during continuous operation from May 1974 through March 1975 at several hydraulic loadings and disc rotation rates. Hydraulic loadings of 2.7 and 5.4 gpd/sq ft (0.11 and 0.22 cu m/day/sq m) at optimum disc rotation resulted in the transformation of an average 240 mg/l influent ferrous iron to produce effluents of 2 and 5 mg/l, respectively. Performance was not impaired when operated at mine water temperatures as low a 8C and the process was shown to recover rapidly when subjected to artificially induced toxicity in the form of a strong disinfectant solution. The process prepared a coal mine drainage containing up to 313 mg/l of ferrous iron for limestone neutralization and subsequent solids precipitation at an estimated operating cost of 4 cent per thousand gallons (1 cent per cu m).
W77-05337

YBBARPSAN-A SMALL RECEPTACLE FOR A LARGE INDUSTRY: LIMNOLOGICAL STUDY OF THE YBBARPSAN RIVER, (IN SWEDISH),
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W77-05339

A CHEMICAL INVESTIGATION OF PHOSPHORUS REMOVAL IN LAKES BY ALUMINUM HYDROXIDE,
Wisconsin Univ.-Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5G.
W77-05367

RECYCLING OF SEWAGE EFFLUENT BY IRRIGATION: A FIELD STUDY ON OAHU, FINAL PROGRESS REPORT FOR AUGUST 1971 TO JUNE 1975.
Hawaii Univ., Honolulu. Water Resources Research Center.
Technical Report No. 94, July 1975. 151 p, 9 fig, 25 tab, 24 ref, 5 append.

Descriptors: *Hawaii, *Water reuse, *Recycling, *Waste water treatment, Irrigation, Effluents, *Reclaimed water, Activated sludge, Municipal wastes, Groundwater, Viruses, Pesticides, Heavy metals, Lysimeters, Soil water, Percolation, Sugarcane, Grasslands, Nitrogen, Sewage treatment, Treatment facilities, Feasibility studies.
Identifiers: Rapid Bloc process, Oxisols, Tropeptic haplustox, Oahu.

The central Oahu site is near the Mililani Sewage Treatment Plant which utilizes the Rapid Bloc activated sludge process (secondary treatment) that achieves a suspended solids and BOD5 removal rate that averages 90%. The site was chosen in part because the adjacent Oxisol field soils are similar to soils on which approximately 90% of the sugarcane cultivated under irrigated conditions on Oahu is grown. The values of guideline chemical parameters for the effluent were below the maximum value for irrigation of sensitive crops. Pesticides and heavy metal concentrations were either below the level of concern or level of detectability. Procedures and guidelines were established for the sequential application of sewage effluent, ditch water, and combinations thereof, to sugarcane in 30 0.04-ha (0.1 acre) test plots. Sewage effluent application for the first year of a 2-yr cane crop cycle increased the sugar yield by about 6% compared with the control plots. However, when sewage effluent was applied for the entire 2-yr crop cycle, sugar yield was reduced by about 6% and the cane quality by about 16% even though the total cane yield increased by about 11%. The quality parameters of percolate were of acceptable concentration from the standpoint of groundwater quality protection. Total dissolved solids and chloride in the percolates met drinking water standards. Human enteric viruses present in the majority of effluent samples examined were absent in all sugarcane and grass percolates sampled over a 2-yr period, thereby suggesting the extremely remote possibility of contaminating deep underground water sources. There was no apparent evidence of significant surface clogging of the soil or of soil chemical properties impairment resulting from sewage effluent irrigation during the first full 2-yr cane crop cycle. Bermudagrass, with periodic cutting and harvesting, proved to be an excellent utilizer of effluent applied nitrogen, thus, excelled sugarcane from the standpoint of groundwater protection. However, fallow or bare soil appears incapable of removing significant amounts of nitrogen from the applied effluent. (See also W75-06361)
W77-05372

CHARACTERIZATION OF SANITARY LANDFILL LEACHATES,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5B.
W77-05432

BOD5 DECREASED TO LESS THAN 10 MG/LITER WITH CARBON ADSORPTION SYSTEM,
Uniroyal Ltd., Elmira (Ontario). Uniroyal Chemical Div.
K. Bradley.
Chemical Processing, Vol. 40, No. 1, p 30-31, January, 1977. 2 tab.

Descriptors: *Waste water treatment, *Chemical wastes, *Industrial wastes, *Activated carbon, Biochemical oxygen demand, Chemical oxygen demand, Carbon, Color, Phenols, Waste treatment, *Canada.

A carbon adsorption system was devised to upgrade aqueous wastes from Uniroyal's organic chemicals plant in Elmira, Ontario. Laboratory and pilot plant testing indicated that a granular activated carbon system could reduce color, COD, BOD, and TOC to a point so that the water pollution control plant could produce a satisfactory effluent. A pulsed carbon bed was used to force spent carbon to a rotary kiln for reactivation. This allowed larger suspended solids loadings without requiring carbon backwashing. Adsorber head pressure was used to move spent carbon to the kiln reactivator feed hopper and a microstrainer screened waste water from an aerated lagoon before entrance into the adsorber. This process provided a 10% cost reduction over similar systems using the usual equipment and entailed minimal startup problems. BOD5 concentrations were reduced from 28 mg/liter to 7 mg/liter, COD fell from 168 to 80 mg/liter, and there were extreme reductions in color and phenolic pollutants in laboratory simulation tests. (Collins-FIRL)
W77-05496

PURIFICATION OF RESIN-FORMING EFFLUENT WATERS FOR BAKELITE MANUFACTURE--INVOLVES CONDENSATION TO USEFUL GLUE RESIN WITH AMMONIA THEN SODIUM HYDROXIDE,
A. M. Yuferov.
Soviet Patent SU-504-708. Issued April 21, 1976. Soviet Inventions Illustrated, Vol. X, No. 46, p D3, December, 1976.

Descriptors: *Patents, *Chemical wastes, *Resins, *Waste water treatment, Waste treatment, Industrial wastes, Water purification, Ammonia, Sodium compounds, Chemical wastes.
Identifiers: Sodium hydroxide, Resinification.

A patent was issued for a process to purify resin-forming effluent waters in bakelite manufacturing. After raising the pH to 7.5-8.5 with NH4OH, these waters, containing phenols and CH20, were purified by boiling for one-half hour after resinification occurred. Condensation was completed by heating after the addition of NaOH. The resultant resin was found suitable for glueing wood at 110-125C. An example using effluent water from novolak 18 manufacturing produced residual formaldehyde at 0.5 g/liter when the pH was brought to 8.5 with NH4OH; after refluxing 35 min NaOH was added, and the mixture was kept at 70 C. With evaporation at 100 mm/50 C, a product containing 40% resin was obtained and used to make birch plywood. (Collins-FIRL)
W77-05497

DECOMPOSITION OF SURFACE ACTIVE SUBSTANCES BY MEANS OF ACTIVATED SLUDGE METHOD (ROZKLAD WYBRANYCH NIEJONOWYCH SUBSTANCJI POWIERZCHNIOWO CZYNNYCH METODA OSADU CZYNNEGO),
E. Rzechowska.
Gaz, Woda I Technika Sanitarna, Vol. 50, No. 10/11, p 304-307, 330, 1976. 4 tab, 32 ref.

Descriptors: *Chemical wastes, *Decomposition, *Biodegradation, *Surfactants, *Textiles, Sewage treatment, Waste treatment, Industrial wastes, Municipal wastes, Treatment, *Waste water treatment, *Activated sludge.
Identifiers: Polyester fibers.

Results of studies were presented on biodegradation of surface active substances (SPC) by use of activated sludge. These studies were concerned with those substances used in polyester fiber production. Tests were conducted with synthetic mixtures similar to municipal waste composition and studies of SPC decomposition in industrial wastes were presented. Parameters were given for optimal purification of sewage containing SPC. (Collins-FIRL)
W77-05498

PURIFYING WASTE LIQUOR-FROM, E.G., SODIUM CARBONATE PRODUCTION, AMMONIA REGENERATION, BRINE PURIFICATION, ETC.
French Patent FR 2295-931. Issued August 27, 1976. Derwent French Patents Abstracts, Vol. X, No. 45, p D5, December, 1976.

Descriptors: *Patents, *Waste treatment, *Chemical wastes, *Waste water treatment, Carbonates, Ammonia, Brines, Separation, Treatment, Industrial wastes.
Identifiers: Sodium carbonate.

A patent was issued for a process to purify aqueous wastes resulting from sodium carbonate manu-

facture. These consist of aqueous solutions from ammonia regeneration and brine purification, as well as aqueous suspensions from the calcination of limestone. The residual products are mixed and concentrated to a concentration of 8-12 weight percent solids. A flocculating agent is added and the deposited solids are separated in two or more operations, preferably with a centrifuge or disc filter, at 70-90 C. A liquid free of chloride ions is added to the separated solids between separations and the liquid from the last separation is mixed with the mixture of residual products from the first step. Solid products with low water content are the results of this process and can be used in fertilizer or cement production. (Collins-FIRL)
W77-05499

DAIRY EFFLUENT ELECTROFLOTATION PURIFIER-HAVING ELECTRODE UNITS IN ALTERNATIVE ROWS WITH GAP CONTROL,
E. K. Adutskevich, V. S. Krutko, and V. A. Petrovich.
Soviet Patent SU-494-180. Issued March 3, 1976. Soviet Inventions Illustrated, Vol. X, No. 44, p D2, December, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Dairy industry, Flotation, Effluents, Equipment, Sedimentation, Liquid wastes, Electrodes, Waste treatment, Farm wastes.

A patent was issued for a unit to purify dairy effluents by electroflotation. Electrodes are constructed with grooves and screws that control the gap between the anode and cathode and are joined by separable connectors. These electrodes are housed in the equipment along with troughs which admit and withdraw the liquid effluents. Added insulating housings control the loss of electrical current and reduce its destructive effects on the equipment. Surface scrapers continuously remove foamed fat which rises to the surface by means of hydrogen and oxygen bubbles produced by electrolysis. (Collins-FIRL)
W77-05500

THE DEPURATION OF WASTE WATERS FROM FOOD-PRESERVING FACTORIES. INFLUENCE OF SODIUM CHLORIDE CONCENTRATION ON THE DEPURATION YIELD OF AN EXTENDED-AERATION ACTIVATED-SLUDGE PLANT (SULLA DEPURAZIONE DEGLI SCARICHI IDRICI DELLE INDUSTRIE CONSERVIERE. INFLUENZA DELLA CONCENTRAZIONE DEL CLORURO SODICO SUL RENDIMENTO DI DEPURAZIONE IN UN IMPIANTO BIOLOGICO FUNZIONATE AD AERAZIONE PROLUNGATA),
C. Leoni, F. Grischott, and G. Bellucci.
Industria Conserve, Vol. 51, No. 3, p 167, 175-182, July-September, 1976. 4 fig, 3 tab, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, *Sodium chloride, Waste treatment, Fish handling facilities, Aeration, Microorganisms, Industrial wastes.

Studies were made concerning microbial cultures responsible for aerobic decomposition of waste waters containing sodium chloride from fish-preserving plants. A laboratory pilot plant study indicated that gradual variations of salt concentrations did not reduce depuration yield and that microbial cultures seemed completely adapted. It was suggested that the natural buffer effect occurring in extended-aeration plants be taken into account. Maximum sodium chloride concentrations used were 100 grams/liter. (Collins-FIRL)
W77-05501

ENVIRONMENTAL MANAGEMENT '76. AN OVERVIEW OF FEDERAL AND PROVINCIAL ACTIVITIES - ENVIRONMENT CANADA, THE BIG CLEAN-UP GOES ON,
For primary bibliographic entry see Field 5G.
W77-05502

NEW PRE-TREATMENT METHOD WITHOUT CHEMICAL REAGENTS FOR ORGANIC WASTES OF WINE DISTILLERIES (NOUVEAU PROCEDE DE PRE-TRAITEMENT REJETS DES D'ORIGINE ORGANIQUE DESTINE AUX DISTILLERIES OU AUTRES SANS APPORT D'ADJUVANTS),
P. Duval.
Industries Alimentaires et Agricoles, Vol. 93, p 1351-1354, November, 1976. 3 fig, 1 tab.

Descriptors: *Biochemical oxygen demand, *Chemical oxygen demand, *Chemical wastes, *Food processing wastes, Flocculation, Sludge treatment, Separation techniques, *Waste water treatment, Pre-treatment(Water).
Identifiers: *Pre-treatment(Waste water).

Amongst agricultural-alimentary industries, wine distilleries are known to cause high degrees of pollution. This is because their waste waters are loaded with greater amounts of COD and BOD than other industrial effluents. Processes currently employed to reduce this pollution require neutralization followed by coagulation, addition of chemical compounds, flotation, and pH adjustment. Such treatment involves high costs in chemical products. The new process described has several advantages: it allows flocculation of spent-mashes, does not require pH adjustment, and allows the separation of flocculated sludges which are not chemically contaminated. These sludges can then be used for cattle feed. (Kutcher-FIRL)
W77-05503

AN APPROACH TO EFFLUENT TREATMENT IN THE FOOD INDUSTRY,
D. G. Holladay.
Process Biochemistry, Vol. 11, No. 10, p 14-16, December, 1976. 2 fig, 7 ref.

Descriptors: *Food processing industry, *Waste water treatment, *Biological treatment, Recycling, Waste disposal, Sludge treatment, Dairy industry, Industrial wastes.

Details of four biological treatment plants for effluents from the food industry, installed by Degremont Laing Limited, England, are described. Food industry treatment plants must consider the following: variations in production periods, seasonal fluctuations of consumer demand, and factory flow and pollution load variations. Special attention is given to product recovery which results in separation of yeast, serum, and pulp in specific industries. The rate of water consumption is also stressed. Biological filtration using high rate plastic media such as cloisonyl and flocor is especially effective in the canning industry and for treating dairy wastes. Sludge treatment design is emphasized by Degremont because of the putrescible nature of food industry sludges. Effluent characteristics and treatment facilities are described for a dehydrated mashed potato treatment works, a brewery, malt houses, and an ice cream and frozen food manufacturer. (Kutcher-FIRL)
W77-05504

AUTOMATIC WASTE WATER PURIFICATION CONTROL-WITH CYANIDE SENSORS AT INLET AND OUTLET REGULATING CHEMICALS. ADDITIONS TO IMPROVE CYANIDE REMOVAL,
N. Ya Karpunin, N. B. Manusova, and D. N. Smirnov.
Soviet Patent SU-489-719. Issued April 20, 1976. Soviet Inventions Illustrated, Vol. X, No. 44, December, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, Equipment, Metals, *Automatic control, Industrial wastes, Toxicity, Monitoring, Environmental control, Chemical treatment.
Identifiers: *Cyanide removal.

A patent was issued for an automatic waste water purification control which could be used for removing cyanides from metal plating plants' effluents. Two sensors are linked to an executive mechanism for improved etoxication of effluents. A correction unit is provided for the cyanide concentrations in the effluents. A signal from the effluent feeding reaches the correction unit and forms a pulse at the speed that the concentration of the input changes. This signal reaches the controller which acts on the control feeding the reagent to the bath. A second signal is fed from the exit point sensors. Membrane electrodes, selective to the cyanide ions, are used to measure the concentration and maintain continuous process control. (Collins-FIRL)
W77-05505

AIDING OF SUSPENDED SOLIDS REMOVAL BY POLYELECTROLYTES (ZASTOSOWANIE POLIELEKTROLITOW DO STRACANIA ZAWIESIN W WODACH DOLOWYCH),
A. Dziubek, A. L. Kowal, J. Mackiewicz, and M. Swiderska-Broz.
In: Metody Fizykochemiczne Oczyszczania Wod I Sciekow (Referaty Z Konferencii Naukowo-Technicznej), May 6-7, 1976, Lublin, Poland, Marie Curie-Sklodowska University, Lublin, Vol. 1, p 24-31. 4 fig, 5 ref.

Descriptors: *Flocculation, *Zeta potential, *Waste water treatment, Suspended solids, *Polyelectrolytes, Mine water, Water temperature, Hydrolysis, Coagulation, *Lime.
Identifiers: *Alum.

Suspended solids removal from mine water was studied. Polyelectrolytes (0.1 to 10 ppm) were used to treat mine water containing 120 to 6300 ppm of suspended solids. Removal was most effective with cationic polyelectrolytes Calgon M-502 and Rokrysol WF-5. These were not affected by low water temperatures. They produced suspended matter flocculation with lower electrokinetic potential values than the hydrolizing coagulants, iron and alum. Suspended solids were efficiently removed by lime coagulation at pH 9.0 and above. (Collins-FIRL)
W77-05506

DETERMINATION OF HARMFUL HEAVY METALS IN PLATING WASTE WATERS (MEKKI HAISUI CHU NO YUGAISEI KINZOKU NO TEIRYO),
Tokyo Metropolitan Research Lab. of Public Health (Japan).
For primary bibliographic entry see Field 5A.
W77-05507

INDUSTRY AND THE ENVIRONMENT,
For primary bibliographic entry see Field 5G.
W77-05508

ELECTROLYTIC PURIFICATION OF INDUSTRIAL EFFLUENTS-FOR REMOVAL OF HEAVY METALS, OIL, ETC.,
M. Itiki, and M. Ishii.
Soviet Patent SU-497-759. Issued April 15, 1976. Soviet Inventions Illustrated, Vol. X, No. 44, p D5, December, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Electrolytes, *Heavy metals, *Oil industry, Industrial wastes, Effluents, Flocculation, Equipment, Hydrogen.

A patent was issued for a device to treat industrial wastes by electrolytic purification. The process is especially useful in the oil industry. The mechanism contains a solution inlet at the top of one end wall and an outlet at the bottom of the opposite end wall, underneath a foam-removing attachment. Anodes are plates or rods of aluminum, aluminum alloys or iron. Cathodes are continuous

or perforated plates of copper, iron, nickel, or stainless steel. The cell bottom can serve as the cathode. Dividing screens of non-electrically conductive materials are placed vertically between the anodes. The effluent enters the cell; undesired materials, the flocculating medium, and oxides from the anodes all float to the surface and form a foam which is removed into a container. The cleaned liquid is expelled. (Collins-FIRL)
W77-05509

DETERMINATION OF PHENOLS AT RESIDUAL LEVELS BY ULTRAVIOLET ELECTRONIC SPECTRA (DETERMINAREA FENOLILOR DIN APELE REZIDUALE CU AJUTORUL SPECTRELOR ELECTRONICE IN ULTRAVIOLET),
For primary bibliographic entry see Field 5A.
W77-05510

TREATMENT OF EFFLUENT BY FLOTATION PROCESSES,
Imperial Chemical Industries Ltd., Hyde (England). Pollution Control Systems.
W. R. T. Cottrell.
Effluent and Water Treatment Journal, Vol. 16, No. 11, p 563-567, November, 1976. 2 fig.

Descriptors: *Waste water treatment, *Separation, *Flotation, *Coagulation, Waste treatment, Anions, Polyelectrolytes, Chemical treatment, Aerobic conditions, Treatment facilities.

Various aspects of waste effluent treatment by flotation processes in England and Sweden were discussed. This process is especially useful in the petroleum industry for removal of oils from waste waters. Effective flotation requires a density difference between two phases so that the necessary separation occurs readily, and a great number of small-sized bubbles are necessary to carry solids or oils to the liquid surface. Flotation processes reviewed were air flotation, dissolved air flotation, and vacuum flotation. Chemical coagulants and flocculants are used to speed solids separation from effluents. A new process (microflotation) was presented and two industrial applications for it were described. Electroflotation is similarly evaluated. The various flotation processes have different cost situations mainly due to the systems which produce the gas necessary for flotation. Electroflotation, for effluent flows below 20 cu m/hr, has the lowest capital costs but power costs are higher than for other processes. Above this flow level, microflotation costs decrease progressively. (Collins-FIRL)
W77-05511

INDUSTRIAL WATER AND AIR POLLUTION CONTROL,
Durban City Engineer's Dept. (South Africa). Chemical Services Div.
K. R. Johnson.
The Certificated Engineer, Vol. 49, No. 9, p 152-160, September, 1976. 9 fig, 1 tab, 8 ref.

Descriptors: *Pollution abatement, *Waste water treatment, *Environmental control, *Industrial wastes, *Oil wastes, Oil industry, Municipal wastes, Treatment facilities, Water pollution sources, Air pollution, Legislation, Africa.
Identifiers: Durban(South Africa).

The effects, related environmental controls, and methods of treatment of industrial wastes in Durban, South Africa, were considered. Municipalities have the greatest responsibility for waste treatment and industries must take care to release effluents for treatment which do not harm bacteriological processes, sewers, treatment plants or treatment plant personnel.Municipalities operate under Sewerage By-Laws which enumerate temperature, pH, and chemical content requirements for industrial effluents which will be treated at municipal treatment facilities. A sand, oil, and grease trap was described for treatment of oil industry effluents, as well as a flocculation procedure for removing suspended solids. Included in this discussion were the oxidation ditch and a dissolved air flotation unit. Smoke control laws to reduce air pollution were included, such as the Municipal Smoke Control Regulations, the Atmospheric Pollution Prevention Act (Number 45 of 1965), and the Offensive Trade Regulations of the Public Health Act. Major sources of air pollution were smoke and grit of industrial boilers and furnaces. These acts provide for prior approval of boilers, furnaces, and incinerators of oil refineries, chemical industries, offal works and the like. It was found that incinerators should meet minimum requirements for a main and afterburner to guarantee complete drying and incineration, and for a simple grit collector. Dust control was also important, and a cyclone-type collector was suggested. (Collins-FIRL)
W77-05512

REMOVAL OF ORGANIC IMPURITIES FROM INDUSTRIAL WASTE WATER - BY ADSORPTION WITH ORGANO SILICON. COMPOUND MODIFIED WITH ALKALINE SOLUTION OF SHUNGITE,
A. E. Gorshtein, N. Yu Baron, and A. S. Pekki.
Soviet Patent SU 508-488. Issued May 21, 1976. Soviet Inventions Illustrated, Vol. X, No. 50, p D6-D7, January, 1977.

Descriptors: *Organic compounds, *Industrial wastes, *Chemical wastes, *Waste water treatment, Adsorption, *Patents, Phenols.
Identifiers: Oleic acid, Shungite.

A patent has been issued for the treatment of waste waters from chemical and metallurgical plants which contain high levels of organic impurities. This treatment scheme is based on the adsorption of organics with an organo silicon compound modified with an alkaline solution of shungite. This patented substance is based on aluminosilicate and consists of a slightly impregnated carbon with a semi-ordered structure to give good extraction of mineral and organic impurities from wastes. Effluent purification is significantly better than with traditional adsorbent methods; oleic acid was removed up to 94.5% as compared to 89.5% and phenols were adsorbed up to 65.4% as compared to 56.6%. In one example provided, such organics-containing effluents were passed through an adsorber by gravity flow. The adsorber had distributive grids packed with 5 to 10 mm shungite chips modified with alkali. Calculations indicated the high degree of purification that resulted. (Kramer-FIRL)
W77-05513

SAND BED FILTER WITH AUTOMATIC SLUDGE DISCHARGE-AS SLUDGE SUMP PRESSURE RISES, USES COMPRESSED AIR TO COMB BED,
D. Parnaby.
Belgian Patent BE-843-668. Issued November 3, 1976. Derwent Belgian Patents Abstracts, Vol. X, No. 47, p D1, January, 1977.

Descriptors: *Patents, *Filtration, *Waste water treatment, Pulp and paper industry, *Filters, Equipment, Industrial wastes, Air, Automatic control, Sludge, Treatment, Effluents, *Pulp wastes.

A patent was issued for a sand bed filter and for a process to filter effluents. Effluents are fed to the center of a filter vessel which allows filtrate to rise through the filter bed as sludge settles to a sump below. A pressure-sensitive device in the sump activates a pneumatically operated discharge valve to remove the sludge. The device also includes compressed air jets which clean the sand bed filter by pneumatic forward flushing. The filter is adjustable for backflusing with filtrate and/or sludge discharge. (Collins-FIRL)
W77-05514

TREATMENT OF WATER AND EFFLUENT: AIR FLOTATION.
Australian Chemical Engineering, Vol. 17, No. 8/9, p 13, August/September, 1976.

Descriptors: *Waste water treatment, Pulp and paper industry, *Flotation, Waste treatment, Biochemical oxygen demand, Environmental control, Equipment, Industrial wastes, Treatment, Sewage treatment, *Pulp wastes.

A dissolved air flotation process known as aeroflotation has been developed. This process has been applied in papermills to eliminate fibers. Micro-bubble action is used to draw away impurities and eliminate them. Flocculant consumption is usually low and the sludge is significantly concentrated. Aeroflotation gives an 85% efficiency. Advantages of this system include clog resistance, resistance to toxic materials, low consumption, compactness, immediate starting, automatic installation, and no supervision requirement. (Collins-FIRL)
W77-05515

REMOVING POLYVINYL ALCOHOL FROM WASTE WATER WITH BORIC ACID OR BORAX-WITH REUSE OF WATER IN TEXTILE SIZING, AND REUSE OF POLYMER BORATE COMPOUND IN TEXTILE SIZING, ADHESIVES, AND TREATING PAPER FIBRES.
Belgian Patent BE-842-227. Issued September 16, 1976. Derwent Belgian Patents Abstracts, Vol. X, No. 42, p D3, November, 1976.

Descriptors: *Patents, *Waste water treatment, Pulp and paper industry, Separation, Alcohols, Industrial wastes, Water reuse, Treatment, Inorganic compounds, Effluents, *Pulp wastes, Polymers.

A patent was issued for a process for the removal of polyvinyl alcohol from waste water by treatment with boric acid or borax. Treatment is carried out at pH 8 to 10 in the presence of an inorganic salt. The polyvinyl alcohol is separated as a compound with boric acid. This compound is pure and colorless. The polymer borate compound can be reused for such purposes as the treatment of paper fibers. (Collins-FIRL)
W77-05516

ON THE DETERMINATION OF COD, BOD, AND TOC IN THE FILTRATE OF SUSPENSIONS FROM PULP, PAPER, AND WASTE PAPER (UBER DIE BESTIMMUNG VON CSB, BSB UND TOC AM FILTRAT VON SUSPENSIONEN AUS HALBSTOFF, PAPIER UND ALTPAPIER),
For primary bibliographic entry see Field 5A.
W77-05517

TREATMENT OF SPENT BISULFITE LIQUOR BY THE TECHNIQUE OF ION-EXCLUSION,
Quebec Univ., Trois-Rivieres.
J-M. Perret, J. J. Garceau, G. Pineault, and S-N. Lo.
Pulp and Paper Canada, Vol. 77, No. 11, p 107-109, November, 1976. 4 fig, 6 ref.

Descriptors: *Waste water treatment, *Ion exchange, Separation, Industrial wastes, Environmental control, Pulp and paper industry, *Pulp wastes, Carbohydrates, Analysis.
Identifiers: *Ion exclusion(Treatment).

Ion-exclusion was investigated in a search for a suitable and economical treatment for removing lignosulfonates and carbohydrates from waste effluents of small bisulfate mills. In theory, passing this waste water through a bed of cationic resin, with distilled water as the eluant, should cause

lignosulfonates to be eluted first and carbohydrates to appear in the effluent after lignosulfonates pass out of the column. Analytical techniques and experimental data were presented. Results indicated that lignosulfonates and carbohydrates were separated to some extent by ion-exclusion with Dowex 50W-Na(+). With this resin, separation increased with porosity in the high yield liquor. Separation efficiency, with high yield liquors, decreased at high liquor loadings and was practically independent of elution rates in the study. No definite conclusion could be drawn concerning the practicality of ion-exclusion for removal of the test substances from bisulfite liquors. More investigations with other resins were recommended. (Collins-FIRL)
W77-05518

PURIFICATION OF WASTE WATER FROM PULP AND PAPER PLANTS BY RADIATION POLYMERIZATION. II. PURIFICATION WITH VINYL ACETATE (OCHISTKA STOCHNYKH VOD PREDPRIYATIY TSELLYULOZNO-BUMAZHNOY PROMYSHLENNOSTI METODOM RADIATSIONNOY POLIMERIZATSII. II. OCHISTKA S PRIMENENIEM VINILATSETATA),
O. A. Gerasimovich, L. A. Kiseleva, A. M. Kovalevskaya, E. P. Petryaev, and O. B. Stebunov.
Vestsi Akademii Navuk BSSR, Seriya Fizika-Energetychnykh Navuk, No. 4, p 40-43, 1976. 4 fig, 1 tab, 5 ref.

Descriptors: Pulp and paper industry, *Industrial wastes, *Irradiation, *Sulfates, Chemical precipitation, Color, Polymers, *Waste water treatment, *Pulp wastes.
Identifiers: *Cesium, *Vinylacetate, *Polymerization.

Radiation treatment has been employed for purification of effluents and solutions of black lye in the manufacture of sulfate cellulose. In one experiment, 0.2% to 3.0% vinylacetate was added to the waste water; the mixture was then irradiated with rays of Cesium 137. Polymerization of the vinylacetate occurred in the range between 0.08 and 0.30 Mrad. This reaction caused precipitation, lowering the amount of lignin to 50% and reducing the color of the purified effluent by 90%. The quality of the precipitates with the use of vinylacetate and methylmethacrilate was improved in a ratio of 1.0:1.5. (Kramer-FIRL)
W77-05519

NEW ION EXCHANGE SYSTEMS FOR THE BEET SUGAR INDUSTRY. PART III. PROCESSING OF ION EXCHANGE WASTE,
Amalgamated Sugar Co., Ogden, Utah.
D. Costesso, A. Gupta, and K. W. R. Schoenrock.
La Sucrerie Belge, Vol. 95, No. 11, p 371-376, November, 1976. 4 fig, 2 tab.

Descriptors: *Waste water treatment, *Food processing industries, *Sugar beets, *Iron exchange, Carbonates, Organic matter, Crystallization, Separation techniques, Industrial wastes.
Identifiers: Catex regeneration, Decolorizer stripping.

A waste handling method is detailed for the beet sugar industry. The waste is from an ion exchange system involving catex regeneration with ammonium carbonate, decolorizer stripping with sodium chloride, and regeneration with a solution of bicarbonates of sodium, potassium and ammonium. Waste products are mostly fractionated into organic impurities and inorganic salts through concentration and crystallization. More than 90% of the beet juice cation is recoverable in carbonate forms. The salt cycle provides nearly all conditions to allow sodium chloride to function as a softener and decolorizer. Calcination after crystallization improves the quality of the product. About 50% of the final waste is organic matter, representing less than 0.5% beets. It is also in concentrated form and possibly suitable as a supplement to be dried on beet pulp. Pilot studies show that the waste handling process can be economically self-supporting. (Collins-FIRL)
W77-05520

APPLICATION OF ION EXCHANGE RESINS IN THE PURIFICATION OF PLATING SEWAGE. 3. TRANSFORMATION OF ION EXCHANGE RESINS DURING THEIR EXPLOITATION (PRIMENENIE IONOOBMENNYKH SMOL DLYA OCHISTKI STOCHNYKH VOD GAL' VANICHESKIKH TSEKHOV. 3. IZMENENIE SVOISTV IONITOV V KHODE EKSPLUATATSII),
E. Butkute, R. Daubaras, and H. Laumenskas.
Trudy Akademii Nauk Litovskoi SSR, Seriya B, Vol. 3, No. 94, p 79-85, 1976. 1 fig, 2 tab, 6 ref.

Descriptors: *Waste water treatment, *Metals, *Anionic exchange, *Resins, Sewage treatment, Absorption, Waste treatment, Environmental control, Effluents, *Ion exchange, Industrial wastes.
Identifiers: Automobile manufacturing plant, *Plating wastes.

Two Soviet anionic ion exchange resins (AB-29-12P and AB-17-18) and two foreign ones (AB-14 and Lewatit MP-600) were studied for modifications during the purification of plating sewage at an automobile plant. Modifications were evaluated by alterations in basicity, resin imbibition, and infrared spectrum. Results indicated that the Soviet resins were very resistant and their basic capacity had not changed during the 3-year test. Basic capcaity of the other resins decreased twice. Alterations in the imbibition of resin AB-14 were most obvious. It was concluded that structural changes occurred in the Soviet resins and functional group degradation occurred in the other two resins. (Collins-FIRL)
W77-05521

CHEMICAL TREATMENT OF WATER FROM A SURFACE TREATMENT PLANT (EPURATION PAR VOIE CHIMIQUE DES EAUX RESIDUAIRES D'UN ATELIER DE TRAITMENT DE SURFACE),
J-C. Boeglin.
Fonderie, No. 361, p 363-370, November, 1976. 2 fig.

Descriptors: *Waste water treatment, *Metals, *Industrial wastes, Environmental control, Mineralogy, Toxicity, Water pollution sources, *Chemical treatment, Surfactants, Treatment facilities, Neutralization, Precipitation, Separation, Ion-exchange, Waste treatment.
Identifiers: Open-circuit treatment, Closed-circuit treatment, Cyanide oxidation, Chromate reduction.

The mineral and toxic nature of waste water is characteristic of pollution produced by the surface treatment industry. This pollution is due to the products used, conveyed by rinse water, and discharged from concentrated baths. Open-circuit of closed-circuit treatments are now in use to pretreat effluents before disposal into the environment. The details of an open-circuit treatment installation are presented. The system involves cyanide oxidation, chromate reduction, neutralization, precipitation, and separation of metallic elements. Advantage of a closed-circuit regeneration process utilizing ion-exchange are also examined. It is suggested that further laboratory and pilot trail studies be conducted to determine the best purification methods, in terms of both technique and economics. (Collins-FIRL)
W77-05522

ASPHALTIC CONCRETE SLUDGE DRYING BEDS,
Toowoomba City Council (Australia).
M. A. Clewett, and R. N. Handyside.
Water (Journal of the Australian Water and Wastewater Association) Vol. 3, No. 3, p. 15-17, September 1976. 2 tab, 4 fig.

Descriptors: *Sludge treatment, *Sewage sludge, *Treatment facilities, *Asphaltic concrete, Drying, Sludge disposal, Operating costs, *Waste water treatment, Design, Construction, Performance.

The design, construction and performance of a new type of sludge drying bed which utilizes an open graded asphaltic concrete in place of the conventional sand-aggregate filter medium is described. Use of the new drainage medium in an existing treatment plant has reduced operating costs, and eliminated the unpleasant and labour-intensive operation of sludge-lifting. The system is applicable to beds of all sizes, and existing sand-aggregate beds are easily converted. (CSIRO)
W77-05525

LAND DISPOSAL OF SEWAGE,
Queensland Dept. of Local Government, Brisbane (Australia).
C. Palmer.
Waste Disposal and Water Management in Australia, Vol. 3, No. 5, p. 3-4, 6-9, 12, September/October 1976. 9 ref.

Descriptors: *Water reuse, *Sewage disposal, *Irrigation, *Land management, Sewage treatment, Sewage effluent, *Waste water disposal, Crop production, Land use, Waste water treatment.

Public concern about water pollution has lead to increasing interest in land disposal of waste water, as an alternative to disposal to a water course. Pretreatment at some or all levels - primary, secondary, tertiary and disinfection - may still be necessary, depending on the eventual use of the effluent. Storage must also be provided, to an extent depending on the input of sewage and the capacity of the land area to receive effluent, which is determined by a water balance model allowing for rainfall, evaporation, runoff and crop requirements. Mitigating the costs of pretreatment and storage are the possible returns from the provision of irrigation and nutrients to crops. The essential factors in the success of this type of scheme are good plant and soil management to utilize the benefits, while preventing the accumulation of harmful elements, and adapting the uses of land and water to avoid risks to livestock and human health. (CSIRO)
W77-05526

WATER RE-USE IN JAPAN,
Water Reuse Promotion Centre, Tokyo (Japan).
Y. Murayama.
Water (Journal of the Australian Water and Wastewater Association) Vol. 3, No. 4, p. 11-15, December 1976. 9 tab.

Descriptors: *Water reuse, Water utilization, Water shortage, Water supply, Water demand, Sewage treatment, Waste water treatment, Projections, Costs.
Identifiers: *Japan.

In spite of an average rainfall which is very high by world standards, Japan's mountainous topography and highly concentrated population contribute to a low effective utilization of water resources, and chronic shortages are predicted for the near future. Among the necessary measures for coping with this situation, reuse of water from municipal sewage and industrial effluent is extremely effective, and also contributes to pollution prevention. The current, projected and potential contribution of treated waste waters to Japan's requirements, together with the capital and operating costs involved, have recently been the subject of detailed surveys. (CSIRO)
W77-05528

5E. Ultimate Disposal Of Wastes

ENERGY, AGRICULTURE AND WASTE MANAGEMENT,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4C.
W77-05308

OUTFALL HAS UNUSUAL ADMINISTRATION, REGIONAL PLAN IS SERVING NEW JERSEY,
Killam (Elson T.) Associates, Inc., Milburn, N. J.
O. Milgram.
Water and Wastes Engineering, Vol. 13, No. 11, p 56, 58, 62-63, November, 1976. 2 fig, 1 tab.

Descriptors: *Outfall sewers, *Automatic control, *Waste water treatment, *Sewage effluent, *Sewerage, Outlets, Administration, Bays, *New Jersey.
Identifiers: Monmouth County(NJ).

The Monmouth County (New Jersey) regional outfall serves twelve communities and diverts treated effluent from environmentally sensitive bays to the Atlantic Ocean. The system includes an ocean section (48 in. diameter), two land sections (48 and 42 in. diameters), and two (8.0 mdg) pump stations and retention basins. Treated effluent from three regional treatment plants is recieved by the Outfall Authority and pumped to the ocean by a common force main. Retention basins are also used as overflows and high flow conditions are handled by using standby outfall pumps and storage capacity of the retention basins. Natural basin sedimentation helps to improved effluent quality. The ocean section is protected by exterior and interior epoxy coastings and a mortar and mesh cover. Model testing was used to determine final design location. Financing was by a combination of federal, state, and county funding. Actual project costs have exceeded projection by only 5%. The system is now automatically operated, and only routing service and maintenance are required. An automatic sampling station monitors effluent quality. The system may, in the future, be adapted to advanced waste treatment methods and reuse schemes. (Collins-FIRL)
W77-05319

THE LYCOMING COUNTY, PENNSYLVANIA, SANITARY LANDFILL: STATE-OF-THE-ART IN GROUND-WATER PROTECTION,
Giddings (Todd) and Associates, State College, Pa.
For primary bibliographic entry see Field 5G.
W77-05363

EFFECTS OF DREDGING AND DISPOSAL ON SOME BENTHOS AT MONTEREY BAY, CALIFORNIA,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5C.
W77-05387

STATUS OF OCEAN DUMPING RESEARCH IN NEW YORK BIGHT,
MESA New York Bight Project Office, Stony Brook.
For primary bibliographic entry see Field 5B.
W77-05443

LAND DISPOSAL OF SEWAGE,
Queensland Dept. of Local Government, Brisbane (Australia).
For primary bibliographic entry see Field 5D.
W77-05526

FIELD STUDIES ON THE SURVIVAL OF COLIFORMS AND E. COLI IN SEAWATER,
South Australia Engineering and Water Supply Dept., Salisbury. Water and Water Pollution Control Lab.
For primary bibliographic entry see Field 5B.
W77-05530

5F. Water Treatment and Quality Alteration

THE USE OF BLUE-GREEN ALGAL VIRUSES AS INDICATORS OF THE EFFICIENCY OF WATER TREATMENT IN ELIMINATION OF HUMAN ENTERIC VIRUSES,
Delaware Univ., Newark. Dept. of Biological Sciences.
D. S. Herson, and J. Noble-Harvey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 190, Price codes: A02 in paper copy, A01 in microfiche. Delaware Water Resources Center, Newark, Completion Report, October 1976. 13 p, 1 fig, 4 tab. OWRT A-028-DEL(1).

Descriptors: Viruses, Cyanophyta, Chlorination, Water treatment, Algae, Delaware, *Bioindicators, Pollutant identification, Enteric bacteria, Sampling, Filtration, Flocculation, Water pollution treatment.
Identifiers: Blue-green algal viruses, *Enteric viruses, *Brandywine River(Del), Virus indicators, LPP-1, Polioviruses.

LPP-1 viruses were consistently detected in untreated Brandywine River water without prior concentration. To detect human enteric viruses, large volumes of untreated water were sampled using a virus concentrator. From a total of 80 gallons tested, three polio type 2 viruses were found. Since it was not possible to determine if the viruses were virulent or vaccine strains, the possibility exists that they were contaminating laboratory strains. LPP-1 and polioviruses were subjected to the water treatment processes of flocculation, filtration and chlorination. Chlorination was by far the most effective treatment against both viruses with LPP-1 being less resistant than the poliovirus. As little as 0.35 ppm chlorine was an effective viricide against both viruses within three minutes of exposure. Therefore, it seems that water companies which maintain a chlorine residual to control bacterial numbers are also effectively keeping the water free of viruses. However, if such a facility finds it desirable to assay for viruses in finished water, a chlorine-resistant strain of blue-green algal virus would be preferable to a human enteric virus because of the simplicity with which these viruses can be assayed.
W77-05107

COMBINING METAL ION AND POLYMER COAGULANTS FOR IMPROVED WATER TREATMENT,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
J. T. Novak, and U-M. Fessehaye.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 193, Price codes: A04 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, November 8, 1976. 55 p, 22 fig, 1 tab, 13 ref, 2 append. OWRT A-075-MO(1). 14-31-0001-5025.

Descriptors: *Coagulation, *Dewatering, *Neutralization, Polymers, Ions, Metals, *Water treatment, Performance, *Sludge treatment.
Identifiers: *Metal ion coagulants, *Polymer coagulants, Charge neutralization.

The performance of metal ion coagulants and polymers were evaluated to determine the coagulant type and dose which would provide both an effective colloidal destabilization and a sludge which dewatered well. Coagulant dose, pH and suspended solids levels were varied. When destabilization was by charge neutralization the sludge dewatered poorly at the optimal coagulant dose. For the 'sweep floc' mechanism the sludge dewatered best at the optimal coagulant dose. This research indicates that the substitution of polymer for metal ion coagulants will have little benefit for improving sludge characteristics.
W77-05111

A MATHEMATICAL MODEL FOR PREDICTING WATER DEMAND, WASTE WATER DISPOSAL AND COST OF WATER AND WASTE WATER TREATMENT SYSTEMS IN DEVELOPING COUNTRIES,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5D.
W77-05328

THE DIRECT FILTRATION PROCESS AND ITS APPLICATION TO SYDNEY'S WATER SUPPLY,
Camp Scott Furphy Pty. Ltd., Sydney (Australia).
G. R. Grantham, and K. A. Waterhouse.
Water (Journal of the Australian Water and Wastewater Association) Vol. 3, No. 3, p. 21-24, September 1976. 1 tab, 3 fig, 2 ref.

Descriptors: *Filtration, *Water treatment, *Australia, *Cities, Water quality, Treatment facilities, Filters, Coagulation, *Water supply.
Identifiers: *Sydney(N.S.W.).

Direct filtration is a water treatment system in which two steps - flocculation and sedimentation - are omitted from the traditional four-step system. The use of the process is limited to waters of low turbidity and colour, is successful only with multimedia filters, and requires careful backwashing design. Pretreatment (coagulation) must be carefully controlled, as there is no lead time for changes, and filter performance should be continuously monitored. The Sydney Water Board has adopted as a general policy that where raw water is drawn from a large storage which provides a considerable retention time between entry and draw-off points, treatment by direct filtration would be investigated. Design criteria and operating experiences of several resulting works are presented. (CSIRO)
W77-05527

WATER RE-USE IN JAPAN,
Water Reuse Promotion Centre, Tokyo (Japan).
For primary bibliographic entry see Field 5D.
W77-05528

5G. Water Quality Control

REVEGETATING COAL MINE SPOILS IN NEW MEXICO: A LABORATORY STUDY,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
E. F. Aldon, and H. W. Springfield.
USDA Forest Service Research Note RM-245, June 1973. p 1-4, 2 fig, 1 tab.

Descriptors: Revegetation, *New Mexico, Organic matter, *Mine wastes, Rehabilitation, Fertilizers, Laboratory tests, Vegetation regrowth, Soil amendments.
Identifiers: *Secale montanum, *Atriplex canescens, *Mine spoils, Mountain rye, Fourwing saltbush.

Emergence and early growth of mountain rye and fourwing saltbush were studied in untreated 3-year-old mine spoils, and in spoils to which organic matter or fertilizer had been added under greenhouse conditions. Emergence and growth were satisfactory from untreated spoils; adding amendments had no effect on seedling emergence or early growth. (Forest Service)

W77-05114

ANALYSIS OF REHABILITATION TREATMENT ALTERNATIVES FOR SEDIMENT CONTROL,
Pacific Southwest Forest and Range Experiment Station, Berkley, Calif.
For primary bibliographic entry see Field 4D.
W77-05116

OIL AND GAS USE CHARACTERIZATION, IMPACTS, AND GUIDELINES,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 6G.
W77-05134

THE IMPACTS OF OUTER CONTINENTAL SHELF DEVELOPMENT ON LAFOURCHE PARISH,
New Orleans Univ., La. Urban Studues Inst.
For primary bibliographic entry see Field 6G.
W77-05136

A PROCESS FOR COASTAL RESOURCE MANAGEMENT AND IMPACT ASSESSMENT,
Coastal Environments, Inc., Baton Rouge, La.
For primary bibliographic entry see Field 6G.
W77-05137

DETERMINATION OF A ZONE OF SANITARY PROTECTION OF SURFACE SOURCES OF A CENTRALIZED WATER SUPPLY, (IN RUSSIAN),
Moldaviskii Antiplague Station, Kishinev (USSR).
B. S. Rusnak.
Gig Sanit 1, p 84-86, 1976.

Descriptors: *Biochemical oxygen demand, Public health, *Self purification, *E. Coli, *Organic matter, Effluents, Water supply, Rivers, *Sewage, Pathogens, Water pollution treatment, Microorganisms.
Identifiers: USSR.

Water self-purification was studied for 3 yr in a 160 km stretch (2-day flow of water) of a model part of a river in the Moldavian SSR (USSR). An increase in the biochemical O1 demand (BOD) was noted in high and spring flood water due to an increase in pollution with surface wash-outs. BOD decreased in the summer. The coli-index decreased in water in the down-stream direction. In the river water (i.e., water other than the high or spring flood water), coli titer (Escherichia coli) decreased downstream and in the summer. In the absence of additional disposal of untreated sewage in the area studied, self-purification from organic matter and pathogenic microflora was completed after 2 days in the river water but not in the high and spring flood water. In the absence of effluents, a stretch of water corresponding to a 3-day flow should be used as the upper limit for the sanitary protection of a centralized water supply.--Copyright Biological Abstracts, Inc.
W77-05203

DIQUAT AND ENDOTHALL: THEIR FATES IN THE ENVIRONMENT,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5B.
W77-05204

SEDIMENTATION IN THE LAKE OF TUNIS: A LAGOON STRONGLY INFLUENCED BY MAN,
Duke Univ., Durham, N.C. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-05206

ACID MINE DRAINAGE TREATMENT WITH THE ROTATING BIOLOGICAL CONTACTOR,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-05210

AIR POLLUTION CONTROL COSTS AND CONSUMPTION PATTERN EFFECTS. A REGIONAL ANALYSIS,
Drexel Univ., Philadelphia, Pa. Coll. of Business Administration.
C. S. Yan, A. M. Chung, E. C. Koziara, and A. G. Verzilli.
Journal of Environmental Economics and Management, Vol 2, No p 60-68, 1975. 1 fig, 6 tab, 10 ref.

Descriptors: *Air pollution effects, *Pollution abatement, *Input-output analysis, *Income distribution, *Economic impact, *Regional analysis, Water pollution, Costs, Economics, Mathematical models, Model studies, Social impact, Pennsylvania, Industrial wastes.
Identifiers: *Philadelphia(Pa).

An input-output model was devised to measure impact of air pollution control costs on various income groups in the Philadelphia (Pa.) region by comparing changes in consumption expenditures induced by the controls. The regional scope of the study also permits analysis of the area before and after application of the controls through examination of control cost shifts from and to the region. The analytical framework consists of three steps: First, a cost estimate for pollution abatement to achieve certain air quality standards is determined for each of several industries. Second, due to interrelationships among the industries, an input-output table is employed to measure total impact of the costs on market prices of goods and services bought by consumers. Third, these price changes together with data on consumption patterns are used to determine impact on consumption expenditures of various income groups. The final step thus allows an overall assessment of the impact of air pollution control costs on real-income distribution. The range of increases in consumption expenditure was found to be fairly narrow, with the middle-income group bearing the largest increase (2.9%) and the highest and lowest groups supporting slightly lower increases (about 2%). The finding implies that all income groups probably share the costs of control about equally, which would lead to a slightly regressive effect on income distribution. The sharing of the region's air quality costs by other areas was also analyzed. (Harris-Wisconsin)
W77-05215

ISSUES AND INNOVATIONS IN ENVIRONMENTAL POLICY IN BRITAIN, WEST GERMANY, AND CALIFORNIA,
California Univ., Berkeley. Inst. of Governmental Studies.
For primary bibliographic entry see Field 6G.
W77-05216

MODEL TO EVALUATE FEEDLOT RUNOFF CONTROL SYSTEMS,
Kansas State Univ., Manhattan. Dept. of Civil Engineering.
J. J. Zovne, T. A. Bean, J. K. Koelliker, and J. A. Anschutz.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. IR1, p 79-92, Proc. Paper 12822, March 1977. 2 fig, 1 tab, 35 ref. R EPA 803 797-01-0.

Descriptors: *Evaporation, *Runoff, *Simulation analysis, *Land development, Landfills, Hydrologic data, Irrigation, Management, Waste water treatment, Water quality, Water pollution control, Digital computers, Design, Evaluation, Monitoring, Disposal, Planning, *Kansas, Equations, Mathematical models, Systems analysis, Hydrologic budget.
Identifiers: *Feeding stuffs.

A continuous simulation digital computer hydrologic model of feedlot runoff control and disposal is demonstrated as a useful design evaluation tool. The model, developed at Kansas State University, is used to establish guidelines and design parameters for feedlot runoff control facilities which will meet the requirements of the Federal Water Pollution Control Act Amendments of 1972. Developed to evaluate performance on a site specific basis, the model examines performance for single point rainfalls, as well as evaluating total performance through extended wet periods. The model continuously monitors the water budget of a feedlot-storage pond-irrigation disposal area control system using historic rainfall and temperature data. It uses only readily availble climate, soil, and crop data so that it can be applied to all major livestock producing areas of the U.S. The model is described in detail and some preliminary results are presented for Kansas conditions. The model is expected to be useful in evaluating applications for 'permits' to discharge and for 208 planning agencies in determining 'Best Management Practices' for feedlots. (Bell-Cornell)
W77-05238

EVALUATING WATER QUALITY IMPACTS OF SMALL STREAMS ON MAJOR URBAN RIVERS,
Hydroscience, Inc., Westwood, N.J.
For primary bibliographic entry see Field 5C.
W77-05249

USING LINEAR PROGRAMMING TO DESIGN OIL POLLUTION DETECTION SCHEDULES,
Naval Underwater Systems Center, Newport, R. I.
D. G. Olson, G. P. Wright, and L. J. McKell.
American Institute of Industrial Engineers, Vol. 8, No. 3, p 350-57, September 1976. 6 fig, 2 tab, 12 ref, append.

Descriptors: *Linear programming, *Water pollution control, *Oil pollution, *Harbors, *Coasts, Aircraft, *Scheduling, Design, Probability, Stochastic processes, Atlantic Ocean, Pacific Ocean, Great Lakes, Constraints, Equations, Mathematical models, Systems analysis, Pollutant identification, Remote sensing.
Identifiers: Shipping statistics, Hazardous material, Gulf coast.

Presented is a flight scheduling system for sensor (infra-red and ultraviolet) equipped aircraft whose mission is the detection and prevention of harbor and coastal oil and hazardous mateial pollution. The aircraft scheduling models is a form of the stochastic aveling alesman problem which can be solved using linear programming. The objective of the model is to maximize the expected numbe of pollution incidents detected per pollution flight. The model requires as input paramets representing probabilities of pollution incidents occurring for different geographical sectors. These parameters are estimated using coastal and harbor shipping statistics for peroleum andhazardous material. The shipping statistics considered include movement of petroleum products along the Atlantic, Pacific and Gulf coasts as well asthe movement of such commodities in the intra-coastal waterway system and the Great Lakes. Particular port characteristics and past pollution incident statistics are also used to estimate required parameters of the scheduling model. The constraints in the model concern the vailbility of aircraft, flight hours, mission hours, and the significant environmental factors which affect the performance of the sensors. (Bell-Cornell)
W77-05250

OPTIONS FOR IMPROVING WATER QUALITY,
Monash Univ. Clayton (Australia). Dept. of Mechanical Engineering.
I. G. Wallis.
International Journal of Environmental Studies, Vol. 6, Nos. 2/3, p 107-120, 1974. 2 fig, 3 tab, 35 ref.

Descriptors: *Water quality control, *Evaluation, Watersheds(Basins), Waste treatment, Efficiencies, Tidal waters, Equations, Estuaries, Systems analysis, *Waste assimilative capacity.
Identifiers: *Waste load, Waste generation, Receiving water, Waste transport, Algebraic expressions.

The waste load, which is the sum of all the different wastes present, determines water quality. An expression for the waste load is derived in terms of five major factors--the number of people living in the watershed, the percapita waste generation, the waste treatment efficiency, the distribution of wastes and the capacity of the receiving water to assimilate waste. To improve water quality, the waste load must be reduced. The possible options for reducing the waste load are determined by examining the means of reducing each of these factors. The algebraic expression obtained for the waste load shows the reltionship between changes in the different control options and the resulting change in water quality. It is concluded that cooperation between national, regional and local authorities is necessary if all waste control options are to be used, but the regional scale provides the greatest opportunity for using these options and hence more flexibility for attacking water quality problems. (Bell-Cornell)
W77-05252

UNCERTAINTY AND PLANNING FOR WATER POLLUTION CONTROL,
Toronto Univ. (Ontario). Dept. of Industrial Engineering.
A. A. Cunningham, and A. P. Wormwell.
International Journal of Environmental Studies, Vol. 6, Nos. 2/3, p 95-106, 1974. 7 fig, 15 ref.

Descriptors: *Water resources development, *Water pollution control, *Alternative planning, *Treatment facilities, *Design, *Optimization, Sewage treatment, River basins, Construction, Expansion, Decision making, Dynamic programming, Simulation analysis, Mathematical models, Streamflow, Constraints, Biochemical oxygen demand, Dissolved oxygen, Economic feasibility, Computer models, Systems analysis, *Risks.
Identifiers: *Cost minimization, Water quality maximization, Multiple objective.

Regional water quality control planning necessitates a method which reconciles multiple objectives; a common approach has been to specify these objectives as constraints on the possible plans, specifying the pollution control objective as a water quality standard. The problem is then to find the least cost plan which satisfies the constraints. The problem, especially in regions experiencing rapid population and industrial growth, presents many elements of uncertainty to the decision making process. Most planning models do not account for this uncertainty. This article describes a dynamic programming model which focuses on the uncertainty in water pollution control. The model is formulated to compare design plans for the construction and expansion of a sewage treatment facility; the model is demonstrated herein for such a facility operating on a river. Three areas of uncertainty--environmental, technological and political--are identified. Described in detail is the way in which uncertainty is taken into account. Considered are: tests of water quality and financial feasibility; classification of treatment plants; plant cost; background streamflow; downstream runoff; simulation model of stream processes; determination of resultant water quality; identification of feasible treatment plans; criteria for evaluation of feasible plans; and solution for optimal plan. Discussed next are data requirements, computational aspects, and the model and its uses. The model is shown effective to solve for cost minimization or for water quality maximization. (Bell-Cornell)
W77-05253

A REVIEW OF RECENT EXTENSIONS OF LINEAR ECONOMIC MODELS TO REGIONAL ENVIRONMENTAL QUALITY ANALYSIS,
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 6B.
W77-05254

ECONOMIC TRADE-OFFS TO LIMIT NONPOINT SOURCES OF AGRICULTURAL POLLUTION,
Iowa State Univ., Ames.
E. O. Heady, K. J. Nicol, and J. C. Wade.
Water, Air, and Soil Pollution, Vol. 5, No. 4, p 415-430, June 1976. 6 fig, 6 tab.

Descriptors: *Pollution abatement, *Economics, *Erosion control, *Alternative planning, *Optimization, Crops, Conservation, Water supply, Agriculture, Land use, Regions, Demand, Transportation, Soil groups, Farm prices, Evaluation, Water resources, Water allocation(Policy), Hydrologic aspects, Constraints, Equations, Model studies, Systems analysis, *Farm wastes, Agricultural runoff.
Identifiers: *Nonpoint pollution sources, *Soil loss, Submodels, Production patterns, Commodities, Cost minimization, *Economic trade-offs.

Described is a national model to evaluate alternative policies and economic trade-offs in limiting nonpoint sources of agricultural pollution. Its emphasis is on control of soil erosion to control soil loss. Built on an interrregional structure, the model includes all farm land in the 48 contiguous states. The model selects for each soil loss level specified the optimal combination of crops and erosion control technologies in each region to accomplish the soil loss objective. The objective function minimizes the cost of producing and transporting the various crop and livestock commodities among producing and land resource regions of origin, regions of processing, and regions of consumption to meet domestic and export demands. The costs of water consumption and transfer are also included in the objective function. The regions and soil groups are made interdependent through regional commodity demands and a transportation submodel. Results show regions with erosive soils sacrifice in reduced income; regons with level soils can crop more intensely and gain greater income. Conservation practices such as reduced tillage increase the amount of pesticides needed in some regions and pose special environmental problems. The South Atlantic region is affected most by soil loss limits to control nonpoint pollution. The Great Plains regions with more level land and limited rainfall are affected least. The farming sector can reduce levels of gross field loss of soil substantialy with only minor effects on the price of food, assuming levels of exports of agricultural commondities at normal levels. (Bell-Cornell)
W77-05255

A PRACTICAL METHODOLOGY FOR RIVER QUALITY SIMULATION THROUGH THE STAGE-WISE GENERATION OF TRANSITION FUNCTION,
University of Petroleum and Minerals, Dhahran (Saudi Arabia). Dept. of Systems Engineering.
S. Hasan, and C. S. Shih.
In: Proceedings of the 1975 Winter Simulation Conference, Sacramento, California, Dec. 18-19, 1975, p 263-266. (Published by Simulation Councils, Inc.) 3 fig, 5 ref.

Descriptors: *Water quality control, *Simulation analysis, *Computer models, *River systems, Methodology, Routing, Headwaters, Downstream, Regional analysis, Streams, Waste water treatment, Equations, Systems analysis, *Texas.
Identifiers: *Transition function, San Antonio(Texas).

It is often necessary to study the effects of urban return flows on the quality of downstream water in a river basin serving a metropolitan area. The quality at the downstream control point is dependent on the quality and quantity of different headwaters, waste treatment discharges, irrigation return flows and urban runoff. These parameters are probabilistic and thus the downstream control point quality will exhibit probabilistic characteristics. The Texas Water Development Board has developed a powerful model (QUAL-I) for stream water quality routing. This system is particularly useful for predicting temporal and spatial distribution of temperature, BOD, DO, and conservative minerals within segments of streams and canals. However, for a fairly large system, the probabilty density function will require too much computer time. Herein, the development and use of a quality transition function is proposed which describes the relationship between the water quality of two points in a stream. The entire river basin is broken into segments for which the QUAL-I Model is applied to develop the quality transition function. By successive development of the transition functions, the control point quality is obtained as a function of the upstream parameters. This final transition function is used to simulate the downstream quality and develop its probability density function. The application of transition function can result in a significant saving on computation requirements. (Bell-Cornell)
W77-05257

UPPER JAMES RIVER BASIN WATER QUALITY MANAGEMENT PLAN.
Wiley and Wilson, Inc., Lynchburg, Va.
Prepared for Virginia State Water Control Board as part of the Comprehensive Water Resources Plan. Planning Bulletin 217-C, 1976. Vol. V-A, Part 1, Summary, 54 p, 7 fig, 13 tab; Part 2, The Plan, 736 p, 104 fig, 117 tab; Part 3, Appendix, 449 p, 125 fig, 37 tab, 183 ref.

Descriptors: *Virginia, *Water pollution control, *Water management(Applied), *Alternative planning, *Forecasting, *Water quality, Carrying capacity, Monitoring, Analog models, Analysis, Aeration, Projections, Water quality standards, Baseline studies, *River basin development.
Identifiers: *James River Basin(VA), Jackson River, Maury River, Appomatox River, Rivanna River, Assimilative capacity, Discharge loadings, Regional treatment, Stream segment classification, Water quality models.

Alternative water quality management strategies are developed and analyzed. The method used is first to identify objectives; subsequently, existing conditions are inventoried and future conditions are projected, the physical carrying capacity is determined, alternatives are surveyed, a plan is selected, and a feedback system is set up for the evaluation of the program's success. Evaluation of existing water quality and the quality that would be expected after implementation of the best practicable treatment of point sources was accomplished through analysis of monitoring data and mathematical analogues. Recommendations were then generated for revising stream segment classifications. Economic, demographic, waste load and flow projections are made through the year 2020. Stream quality models and monitoring data are used to determine the assimilative capacities of stream segments and thereby allocate discharge loadings. Past violations of water quality standards are identified through examination of monitoring data. Dischargers who must reduce their loadings beyond secondary or best practicable treatment

are identified; water quality management and pollution control alternatives are generated; traditional control practices proven effective in the past are emphasized; and less traditional technologies including land application and in-stream reaeration are investigated. Management evaluations focus on the determination of the most efficient arrangements for regionalization of treatment facilities and other joint treatment schemes. (Nessa - NC)
W77-05294

A REVIEW AND ANALYSIS OF ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGIES,
Construction Engineering Research Lab. (Army), Champaign, Ill.
For primary bibliographic entry see Field 6G.
W77-05296

AGRICULTURE AND CLEAN WATER (PROCEEDINGS OF A CONFERENCE ON AGRICULTURAL WATER POLLUTION CONTROL),
Midwest Research Inst., Kansas City, Mo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 113, Price codes: A08 in paper copy, A01 in microfiche. Proceedings of a Conference held on April 3, 1975, in Kansas City, Missouri. C. C. Chappelow, Jr. (Editor).

Descriptors: *Return flow, *Agriculture, Pollution, Sediments, Erosion, Fertilizers, Nutrients, Livestock, Water quality, Water quality control, Water pollution control.

A 1-day conference was held to promote a constructive dialogue on the development of plans for the control of agriculture related nonpoint source pollution arising from sediment erosion, fertilizer runoff, livestock wastes and pesticide residues. The morning session was devoted to an analysis of the state of the art on nonpoint source pollution related to agriculture with presentations on: (1) regional aspects and viewpoints; (2) agricultural pollution control; (3) technical basis of control; (4) conservation districts; (5) soil conservation; and (6) plant nutrients. The luncheon session was concerned with an economic overview, consisting of an address on economic problems and opportunities of pollution control. The afternoon session was designed to explore elements of control strategy planning for nonpoint pollution from agricultural sources with papers on: (1) the states' role; (2) one state's approach; and (3) the role of the farmer and agribusiness. The afternoon session was concluded with a panel discussion on the development of a practicable agricultural pollution control plan. Over 175 individuals from 20 states representing local, state, regional, and federal agricultural and environmental agencies attended the conference. Included in the 75 different organizations represented at the conference were attendees from farmer associations, educational institutions, and agribusiness. (Skogerboe-Colo St)
W77-05305

NATURAL METHODS OF PURIFYING WASTE WATERS AND UTILIZING THEM IN AGRICULTURE, BIBLIOGRAPHY, PARTS 1 AND 2,
Cold Regions Research and Engineering Lab., Hanover, N.H.
Draft Translation No. 505, December 1975. 110 p.

Descriptors: *Waste water treatment, *Agriculture, *Water supply, Irrigation, Sewage treatment, *Water purification, *Self purification, *Bibliographies.
Identifiers: *Waste water purification.

This bibliography gives a list of Russian published material on agricultural utilization of waste waters and natural methods of purifying them on agricultural and municipal irrigation fields. Materials on questions of self-purification of the soil from pollutants and sanitary and hygenic evaluations of soil methods are presented as completely as possible. The bibliography was updated in 1971 to contain a total of 2,200 titles. (Skogerboe-Colo St)
W77-05306

ENERGY, AGRICULTURE AND WASTE MANAGEMENT,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4C.
W77-05308

RECYCLING AGRICULTURAL RUNOFF,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-05333

THE ROTATING BIOLOGICAL CONTACTOR FOR BIOCHEMICAL FERROUS IRON OXIDATION IN THE TREATMENT OF COAL MINE DRAINAGE,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-05337

THE LYCOMING COUNTY, PENNSYLVANIA, SANITARY LANDFILL: STATE-OF-THE-ART IN GROUND-WATER PROTECTION,
Giddings (Todd) and Associates, State College, Pa.
M. T. Giddings, Jr.
Ground Water, Vol. 15, No. 1, p 5-14, January-February 1977. 4 fig, 3 ref.

Descriptors: *Landfills, *Leachate, *Groundwater, *Water pollution control, Waste disposal, Garbage dumps, Land forming, Runoff, Groundwater movement, Sanitary engineering, Solid wastes, Disposal, Monitoring, Pollution, Impervious membranes, Leakage, Civil engineering, Pennsylvania.
Identifiers: *Sanitary landfills, *Groundwater protection.

A 120-acre sanitary landfill site is being developed in north-central Pennsylvania to serve a six-county area. The design of the site will prevent groundwater contamination by leachate from the refuse through the use of a 20-mil (.5 mm) PVC plastic liner which will lie between two protective layers of sand containing drainpipe networks. Sampling of the composite groundwater flow from the underdrainplipe network in the sand blanket under the liner provide sensitive monitoring of the liner performance. In the unlikely event of a leak, the pipe draining that area would be diverted to the leachate treatment facility, thus providing a backup leachate collection system. A thick (15 to 75 ft, 4.6 to 22.9 m) glacial till deposit is present at the site and confines groundwater flow within the underlying shale bedrock. The low permeability of the till and the artesian head within the bedrock flow systm provide additional protection against groundwater conamination. Operation of the site will be by the area-fill method; the refuse will be deposited in 8-ft (2.4-m) lifts up to a maximum height of 120 ft (36.6 m). Based on an initial refuse deposit rate of 400 tons (363 metric tons) per day, the site is explected to have a 20-year life at a disposal cost of approximately $5 per ton. Till and bedrock monitoring wells at the site will be used to evaluate the performance of this landfill; analysis of the nearby privated wells will be provide to the owners to demonstrate confiderence in the design and the satisfactory operation of the groundwater protection measures. (Sims-ISWS)
W77-05363

GROUND-WATER CHEMICAL QUALITY MANAGEMENT BY ARTIFICIAL RECHARGE,
Agricultural Research Service, Fresno, Calif. Western Region.
For primary bibliographic entry see Field 5A.
W77-05364

A CHEMICAL INVESTIGATION OF PHOSPHORUS REMOVAL IN LAKES BY ALUMINUM HYDROXIDE,
Wisconsin Univ.-Madison. Water Chemistry Lab.
S. J. Eisenreich, D. E. Armstrong, and R. F. Harris.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 696, Price codes: A04 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS-WRC-77-02, 1977. 51 p, 5 tab, 16 fig, 53 ref. OWRT B-088-WIS(2), 14-31-0001-4140.

Descriptors: *Phosphorus, *Lakes, *Eutrophication, *Algae, *Chemicals, *Metals, *Wisconsin, Detergents, Organic wastes, Water pollution effects, *Water pollution treatment.
Identifiers: *Snake Lake(Wis), *Pickerel Lake(Wis), *Phosphorus removal, *Organic phosphorus.

The chemical factors controlling the removal of phosphorus from lake waters by aluminum hydroxide were investigated. Chemical factors studied were dose size, settling time, pH, rate of phosphorus removal, and sorption and hydrolysis of model organic phosphorus species. Efficient removals (greater than 80 percent) of particulate phosphorus and inorganic phosphorus were found over a range of seasons, locations and depths, but organic phosphorus removal averaged only 50 percent over two years. On a seasonal basis, the most efficient removal of total phosphorus occurred following spring and fall overturn when inorganic phosphorus was the dominant phosphorus form present. The organic phosphorus fraction not removed by alum was apparently dissolved and not readily exchangeable with 32-P-labelled inorganic phosphorus. Based on interaction with aluminum hydroxide, the lake water organic phosphorus fraction not removed differed in chemical properties from several model organic phosphorus compounds investigated. Solution composition was a minor factor in the inefficient removal of organic phosphorus from lake water by aluminum hydroxide.
W77-05367

A CHARACTERIZATION OF URBAN STORMWATER RUNOFF IN BOULDER, COLORADO,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-05369

POLLUTIONAL CHARACTERISTICS OF URBAN SNOWMELT RUNOFF,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-05370

CONSUMER EVALUATION OF THE QUALITY AND COST OF DOMESTIC WATER,
California Univ., Berkeley, School of Public Health.
W. H. Bruvold, and R. N. Mitchell, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 703, Price codes: A06 in paper copy, A01 in microfiche. California Water Resources Center, Technical Completion Report, Contribution 159, July, 1976. 103 p, 7 fig, 34 tab, 27 ref, 3 append. (California Water Resources Center Project UCAL-WRC-W-359).

Descriptors: *Domestic water, *Water quality, Economics, Costs, *Taste, *Attitudes, *California, Evaluation, Dissolved solids, Regression analysis, Surveys.
Identifiers: *Total dissolved solids, *Consumer surveys.

The research had three aims: (1) to relate the total dissolved solids (TDS) in domestic water to consumer evaluation of taste quality by a taste scale rating procedure; (2) to relate TDS in domestic water to the out-of-pocket monthly penalty cost aggregate incurred because of minerals in water; and (3) to relate TDS in domestic water to the amount consumers would be willing to pay more per month for water of improved quality. This research met the five criteria that all research on consumer evaluation of water quality must meet. Consumer surveys were conducted in 15 water distribution zones carefully selected from the 20 largest cities in California. One hundred respondents were interviewed in each zone using a refined interview schedule and yielding 1,500 cases for the entire study. Major results were presented as first order regression equations using TDS as the independent variable. Taste scale rating results indicated that waters containing more than 500 mg/l of TDS are perceptually unacceptable for drinking. Monthly penalty cost results indicated that the cost of demineralization, or the costs for alternative lower TDS supplies, could be lower than aggregate out-of-pocket monthly payments associated with mineral content in water. Willingness to pay more results indicated that consumers are presently willing to pay greater amounts for water if such payments will produce significant improvements in quality making purchase of bottled water and home water softening unnecessary. (Snyder-California, Davis).
W77-05371

SEAMALERT, CURRENT SURFACE-MINED RECLAMATION LITERATURE ALERTING SERVICE.
Arizona Univ., Tucson. Office of Arid Lands Studies.
Report 2-77, Vol. 1, No. 2, March 1977. 47 p.

Descriptors: *Strip mines, *Bibliographies, Coal mines, *Land reclamation, Land use, Environmental effects, Mine drainage, *Mine wastes, *Vegetation establishment, *Vegetation regrowth, Information exchange, Pollution abatement, Water pollution control.
Identifiers: *Mine reclamation, Mine spoils.

SEAMALERT is an information announcement bulletin prepared to provide bibliographic references to current literature of interest to the USDA Forest Service SEAM program. SEAM, an acronym for Surface Environment and Mining, is a program to research, develop and apply technology that will help maintain a quality environment and other surface values while helping to meet the nation's mineral requirements. SEAM is intended for use by all land managers, regional planners, mining industries and political jurisdictions at all levels. SEAMALERT is computer-produced. The content of each issue cumulate to form the SEAMINFO data base, retrievable by subject descriptors. The SEAMINFO data base may be searched retrospectively for information retrieval purposes. This issue contains 150 citations to the literature. SEAMALERT is a cooperative production of the USDA Forest Service, EPA, and the University of Arizona. Citations to literature appearing in the bulletin have been located and prepared by personnel from the Office of Arid Lands Studies and the College of Agriculture, Architecture and Mines at the University of Arizona, Tucson. Author and keyword indexes are included.
W77-05373

FIELD DETECTION AND DAMAGE ASSESSMENT MANUAL FOR OIL AND HAZARDOUS MATERIAL SPILLS.
Environmental Protection Agency, Washington, D.C. Div. of Oil and Hazardous Materials.
For primary bibliographic entry see Field 5A.
W77-05374

HYDRODYNAMIC DAMPING AND 'ADDED MASS' FOR FLEXIBLE OFFSHORE PLATFORMS,
California Univ., Berkeley.
C. Petrauskas.
Army Coastal Engineering Research Center, Ft. Belvoir, Va., Technical Paper No. TP-76-18, October 1976. 110 p, 41 fig, 1 tab, 47 ref, 2 append. DACW72-69-C-0001.

Descriptors: *Offshore platforms, *Oil pollution, *Pollution abatement, *Resources development, *Deep water, *Safety factors, Continental Shelf, Drilling, Engineering.
Identifiers: *Outer Continental Shelf, *Offshore technology, Wave force, Pollution prevention.

The discovery of oil in water depths up to 1,000 feet is one of the primary factors that has stimulated research on the problem of dynamic response of fixed offshore platforms. In water depths less than 400 feet a static design based on the force due to an expected maximum wave during the lifetime of the platform is usually sufficient to guarantee a stiff platform whose first-mode frequency is sufficiently high so that dynamic response due to waves can be neglected. However, in deeper water economical static designs will tend to decrease the first-mode frequencies. An experimental study was made in an attempt to verify the hydrodynamic damping implied by the quasi-steady drag-force interaction term of the presently used modified Morison equation to represent the drag force on an oscillating cylinder in waves. Damping was measured for an elastically supported circular cylinder in a steady current. The measured values were up to 4 times lower than the theoretical values. The disagreement appears to be that the experiments were outside the range for which the quasi-steady assumption is valid. Coefficients of added mass were also measured and were found equal to the potential theory value irrespective to the velocity of the current. (Sinha-OEIS)
W77-05375

AQUEOUS SOLUBILITIES OF WEATHERED NORTHERN CRUDE OILS,
Toronto Univ. (Ontario). Dept. of Chemical Engineering and Applied Chemistry; and Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
For primary bibliographic entry see Field 5A.
W77-05376

EVALUATION OF MULTI-PURPOSE OFFSHORE INDUSTRIAL-PORT ISLANDS: GENERAL ISLAND CHARACTERISTICS.
Delaware Univ., Newark, Coll. of Marine Studies.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 335, Price codes: A21 in paper copy, A01 in microfiche. Delaware University College of Marine Studies Final Technical Report to NSF-RANN No. NSF-RE-E-75-054A, May 1975. 593 p. P. Swatek, Project Manager.

Descriptors: *Resources development, *Baseline studies, *Environmental effects, *Water pollution, Water resources, Coasts, Islands, Harbors, Facilities, Industries, Marketing, Legal aspects.
Identifiers: *Outer Continental Shelf, *Artificial islands, *Artificial ports, *Resources management, *Energy resources, Siting, Site selection, Environmental assessment.

This report is the first of a two volume set to evaluate the possibility of construction of large artificial industrial/port islands to be located off the U.S. Atlantic and Gulf Coasts. Participants in addition to the University of Delaware were: Texas A & M University, Frederick R. Harris, Inc. and Gilbert Associates, Inc. This volume contains the following articles: (1) Market Demand and General Location Options; (2) Process Description and Adaptation Study; (3) Civil Engineering Considerations; (4) Environmental Assessments; and (5) Legal/Political Aspects. (See W77-05378 thru W77-05382) (Sinha-OEIS)
W77-05377

MARKET DEMAND AND GENERAL LOCATION OPTIONS,
Texas A and M Univ., College Station. Industrial Economics Research Div.; and Delaware Univ., Newark. Dept. of Business Administration.
For primary bibliographic entry see Field 6D.
W77-05378

PROCESS DESCRIPTION AND ADAPTATION STUDY,
Gilbert/Commonwealth Associates, Reading, Pa.
W. G. Yeich.
In: 'Evaluation of Multi-Purpose Offshore Industrial-Port Islands: General Island Characteristics', Delaware Univ. Final Tech. Rept. to NSF-RANN, No. NSF-RE-E-054A, p 170-207, May 1975. 8 fig, 12 tab, 5 ref.

Descriptors: *Industries, *Water requirements, *Waste disposal, *Resources development, Transportation, Facilities.
Identifiers: *Outer Continental Shelf, *Artificial islands, *Artificial ports, *Energy resources, *Waste heat utilization, Wastes discharge.

The primary candidate industries have one or more of the following characteristics in common: limited compatibility with human residential and recreational activities despite extensive pollution control and beauty treatment; energy resource intensive and considered an objectionable point source of heat rejected to the environment; and feed stocks and/or products compatible with transportation by large ships. A portion of the report describes the processes that would most likely be incorporated by each candidate industry. It describes, as an example, one scheme of process integration for the candidate industries, and identifies promising areas of research and development that would improve the adaptability of industrial processes to an off-shore island site. The primary feasibility of the island are the areas required to support the industry tenants and support facilities, the material movements to and from the island to supply the industry tenants and market the products, the capital costs of the tenant processes and the operating manpower requirements. Variables that entered into the investigation of industry integration are the fresh water and energy requirements of each industry process and the nature and quantity of wastes discharged. (See also W77-05377) (Sinha-OEIS)
W77-05379

ENVIRONMENTAL ASSESSMENT,
Delaware Univ., Lewes. Coll. of Marine Studies.
For primary bibliographic entry see Field 6G.
W77-05381

LEGAL/POLITICAL ASPECTS,
Delaware Univ., Newark. Center for the Study of Marine Policy.
For primary bibliographic entry see Field 6E.
W77-05382

MARINE POLLUTION RESEARCH TITLES.
Marine Biological Association of the United Kingdom, Plymouth (England). Marine Pollution Information Centre.

For primary bibliographic entry see Field 5A.
W77-05383

PROTOTYPE HIGH-SEAS DISC-DRUM OIL RECOVERY SYSTEM,
Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif.
C. F. Scharfenstein, and W. T. Beran.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 000, Price codes: A11 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development, Washington, D.C., Report No. CG-D-150-75, June 1975. 244 p, 5 append. DOT-CG-24231-A and -32782-A.

Descriptors: *Oil spills, *Oil pollution, *Water quality control, *Skimming, *Water pollution, *Pollution abatement, Separation techniques, Prototypes.
Identifiers: *Oil recovery, Sea state, Disc-drum oil recovery.

The delivered oil recovery unit was designed to recover up to 1,000 gpm of a wide variety of oils in up to Sea State 4 conditions, to survive Sea State 6, and to return to operating at a spill scene without major repair. The disc-drum oil recovery device is supported afloat by a catamaran made of inflatable rubber pontoons. Machinery is installed in the twin hulls and in the cross-structure connecting them. Principal machinery components are the diesel prime mover, the four recovered-oil transfer pumps, and the hydraulic power transmission system power pumps and drive motors. The system is remotely controlled, refueled, and monitored through a 330-ft-long umbilical. Recovered oil is transferred through a 300-ft-long, 10-in-diameter transfer hose to a distribution manifold onboard the tending vessel. The two-unit system is transportable in a Coast Guard HC-130-B aircraft, on a truck trailer, and onboard a wide variety of ships. (Sinha-OEIS)
W77-05384

THE VALUE AND VULNERABILITY OF COASTAL RESOURCES: BACKGROUND PAPERS FOR REVIEW AND DISCUSSION.
Georgia Dept. of Natural Resources, Atlanta, Resource Planning Section.
For primary bibliographic entry see Field 2L.
W77-05390

AN OVERVIEW OF COASTAL GEORGIA WILDLIFE,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 2L.
W77-05396

COASTAL DEVELOPMENT AND AREAS OF ENVIRONMENTAL CONCERN,
North Carolina State Univ., Raleigh. Sea Grant Advisory Services.
For primary bibliographic entry see Field 2L.
W77-05402

DREDGING AND BIRDS IN THE NORTH CAROLINA ESTUARY,
North Carolina Univ. at Wilmington. Dept. of Biology.
For primary bibliographic entry see Field 6G.
W77-05408

DISTRIBUTION OF BENTHIC MACROINVERTEBRATES IN AN ARTIFICIALLY DESTRATIFIED RESERVOIR,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W77-05485

TOXICITY OF COPPER TO DAPHNIDS IN RECONSTITUTED AND NATURAL WATERS,
Miami Univ., Oxford, Ohio.
R. W. Winner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 915, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/3-76-051. May, 197. 68 p, 24 fig, 24 tab, 17 ref. Grant No. R802210.

Descriptors: *Environmental effects, *Copper, *toxicity, *Daphnia, Ponds, Natural waters, Water pollution effects.
Identifiers: Reconstituted water.

Survival of Daphnia magna was highly variable in Marking's reconstitued, standard water and medium waters. Most of the variation was due to variations in the quality of the distilled water. D. magna reared in reconstituted, standard water lost the biramous portons of their swimming antennae about 24 fays after birth and neither the use of ultrapure standard water, nor vigorous aeration of the distilled water base prevented this. Onset of antennal damage was delayed by doubling the Ca concentration. Populations fed vitamin-enriched algal food and maintained in pond water showed no population depressions or die-offs over a 2-year period. D. magna and D. pulex were significantly less sensitive to an acute copper stress than were K. parvula and D. ambigua. There was no significant difference in sensitivity to a chronic copper stress when reduced longevity was used as the index. (Chilton-ORNL)
W77-05490

THE BACTERICIDAL EFFECT OF BDELLOVIBRIO BACTERIOVORUS, ONE OF THE ORGANISMS EFFECTIVE IN AUTO-PURIFICATION OF WATER, (IN TURKISH),
Hifzissiha Okulu, Ankara (Turkey). Halk Sagligi Lab.
For primary bibliographic entry see Field 5C.
W77-05494

DISAPPEARANCE AND MIGRATION OF PROPANIL AND ITS METABOLITE 3,4-DICHLORANILINE IN AN IRRIGATED LANDSCAPE, (IN RUSSIAN),
Akademiya Nauk SSSR, Pushchino. Inst. of Agrochemistry and Soil Sciences.
For primary bibliographic entry see Field 5B.
W77-05495

ENVIRONMENTAL MANAGEMENT '76. AN OVERVIEW OF FEDERAL AND PROVINCIAL ACTIVITIES - ENVIRONMENT CANADA, THE BIG CLEAN-UP GOES ON,
Water and Pollution Control, Vol. 114, No. 11, p 21-22, 25, 27, 30, 32-33, November, 1976.

Descriptors: *Industrial wastes, *Waste treatment, *Environmental control, *Food processing industries, Water pollution sources, Water pollution treatment, Treatment facilities, Dewatering, Toxicity, Pollutants, Sludge treatment, Legal aspects, Legislation, *Canada, Air pollution.

A review of Canadian efforts to combat water and air pollution was presented, as well as efforts to promote environmental conservation. Water pollution control guidelines were issued for several industries, including potato processing, meat and poultry, and fish processing organizations. Among several on-going investigations, parameters which influence dewaterability of various industrial sludges and effects of treatment processes on the toxicity of industrial waste effluents were discussed. Investigations on sources and control of air pollution were also reported. Technologically innovative, new, or experimental waste treatment methods and facilities were also presented. Finally, various legislative changes and proposals were discussed. (Collins-FIRL)
W77-05502

INDUSTRY AND THE ENVIRONMENT,
A. T. Alexander.
CHEMSA, Vol. 2, No. 10, p 176-179, October, 1976. 1 fig, 1 tab, 5 ref.

Descriptors: *Industrial wastes, *Environmental control, *Metals, *Pulp and paper industry, Monitoring, Analysis, Waste treatment, Engineering education, Air pollution, Water pollution control, Solid wastes, Africa.
Identifiers: *South Africa.

The problems of control and disposal of liquid, solid, and gaseous industrial wastes were considered in South Africa. The differing situations of various industries, for example, iron and steel and pulp production, require modified or alternative approaches. The observations made revolve about three aspects of environmental control: monitoring of inputs, process improvements to reduce inputs, and removal processes. Criteria for air and water quality are vastly available, but a substantial update and increase in this information as well as a good information retrieval service are necessary. Technological techniques are also outlined for air, water, and solid wastes pollution control. Various educational options for raining environmentalists and pollution control experts are reviewed. (Collins-FIRL)
W77-05508

INDUSTRIAL WATER AND AIR POLLUTION CONTROL,
Durban City Engineer's Dept. (South Africa). Chemical Services Div.
For primary bibliographic entry see Field 5D.
W77-05512

WERRIBEE RIVER BASIN: PROPOSALS FOR WATER RESOURCES MANAGEMENT,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
For primary bibliographic entry see Field 4A.
W77-05524

FINAL ENVIRONMENTAL STATEMENT. VOL I, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
For primary bibliographic entry see Field 6G.
W77-05536

FINAL ENVIRONMENTAL STATEMENT. VOL 2, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
For primary bibliographic entry see Field 6G.
W77-05537

FINAL ENVIRONMENTAL STATEMENT. VOL 3, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
For primary bibliographic entry see Field 6G.
W77-05538

FINAL ENVIRONMENTAL STATEMENT. VOL 4, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
For primary bibliographic entry see Field 6G.

W77-05539

FINAL ENVIRONMENTAL STATEMENT. VOL 5, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
For primary bibliographic entry see Field 6G.
W77-05540

SILT AND POLLUTION CONTROL FOR MARINE FACILITY,
Sun Shipbuilding and Dry Dock Co., Chester, Pa. (Assignee).
S. C. Light, Jr.
U.S. Patent No. 3,984,987, 5 p, 10 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 951, No 2, p 496, October 12, 1976.

Descriptors: *Patents, *Water pollution control, *Oil spills, *Oil pollution, *Water quality control, *Pollution abatement, Silting, Water pollution, Barriers, Facilities, Docks.
Identifiers: Containment, Oil pollution prevention, Silt control.

The apparatus for preventing silt from entering a marine facility and providing spill containment is constructed of several elements. A floating barrier provides the means whereby liquid spills, e.g., fuel oil, are cotained within a confined area to pemit more complete and easier recovery. Connected to the barrier is a flexible curtain which is anchored to the floor of the water body. The curtain prevents silt from entering the area and thereby avoids the necessity of periodic dredging. The curtain also contains at least one opening so that the tidal flow can enter and leave the facility. The barrier and curtain are connected in such a fashion to a fixed structure, e.g., a pier or dock, so that the barrier and curtain can rise and fall with the tides. They are also connected so that both can be moved to permit the passage of a ship. (Sinha-OEIS)
W77-05599

OIL POLLUTION COMPLIANCE MONITOR,
Exxon Research and Engineering Co., Linden. (Assignee).
For primary bibliographic entry see Field 5A.
W77-05600

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMAL USE OF WATER AND RELATED RESOURCES FOR DIVERSIFIED FARMING ON OAHU, HAWAII: A HYPOTHETICAL STUDY,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 3F.
W77-05105

RURAL RESIDENTIAL WATER DEMAND: AN ECONOMETRIC AND SIMULATION ANALYSIS,
Kentucky Univ., Lexington. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6D.
W77-05187

REORIENTATION OF URBAN-RELATED WATER RESOURCES RESEARCH,
Rutgers - The State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 3D.
W77-05188

MODEL FOR LAYOUT AND DESIGN OF SEWER SYSTEMS,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-05195

AIR POLLUTION CONTROL COSTS AND CONSUMPTION PATTERN EFFECTS. A REGIONAL ANALYSIS,
Drexel Univ., Philadelphia, Pa. Coll. of Business Administration.
For primary bibliographic entry see Field 5G.
W77-05215

METHOD FOR EVALUATING IRRIGATION PROJECTS,
Economic Research Service, Washington, D.C. Natural Resource Economics Div.
For primary bibliographic entry see Field 3F.
W77-05237

MINIMIZING CANAL CAPACITY FOR IRRIGATED RICE,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-05239

OPTIMAL CROPPING PATTERN FOR BASIN IN INDIA,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3F.
W77-05240

THE CONTROL OF A MULTIPURPOSE RESERVOIR,
Trinity Coll., Dublin (Ireland).
For primary bibliographic entry see Field 4A.
W77-05241

A COMPARISON BETWEEN A MONTHLY SIMULATION AND AN ANNUAL MORAN MODEL OF VAAL DAM,
Natal Univ., Durham (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-05243

OPTIMIZATION OF WATER PUMPING COSTS BY HIERARCHICAL METHODS,
Sheffield Univ. (England). Dept. of Control Engineering.
For primary bibliographic entry see Field 6C.
W77-05245

MINIMUM COST DESIGN USING A PREPLANNED NODAL SEARCH METHOD,
For primary bibliographic entry see Field 4A.
W77-05246

DECOMPOSITION OF WATER DISTRIBUTION NETWORKS,
Illinois Inst. of Tech., Chicago.
For primary bibliographic entry see Field 4A.
W77-05251

UNCERTAINTY AND PLANNING FOR WATER POLLUTION CONTROL,
Toronto Univ. (Ontario). Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5G.
W77-05253

ECONOMIC TRADE-OFFS TO LIMIT NON-POINT SOURCES OF AGRICULTURAL POLLUTION,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5G.
W77-05255

IMPACTS OF STATE LAND USE AND ENVIRONMENTAL REGULATIONS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 6G.
W77-05256

A PRACTICAL METHODOLOGY FOR RIVER QUALITY SIMULATION THROUGH THE STAGE-WISE GENERATION OF TRANSITION FUNCTION,
University of Petroleum and Minerals, Dhahran (Saudi Arabia). Dept. of Systems Engineering.
For primary bibliographic entry see Field 5G.
W77-05257

SOME PROBLEMS IN THE SIMULATION OF VERY LARGE HYDRODYNAMIC SYSTEMS,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W77-05258

THE ASYMPTOTIC DISTRIBUTION OF THE RANGE AND OTHER FUNCTIONS OF PARTIAL SUMS OF STATIONARY PROCESSES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4A.
W77-05347

6B. Evaluation Process

IMPROVING INFORMATION DISSEMINATION AND TECHNOLOGY TRANSFER IN THE WATER RESOURCES FIELD,
Missouri Water Resource Center, Columbia.
R. L. Lee, and E. Ferraro.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 210, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, Dec 15, 1976. 86 p, 39 ref. OWRT X-145-MO(4269)(2).

Descriptors: *Communication, Photography, *Films, *Information exchange, Documentation, Streams, Rivers, Attitudes, Social aspects.
Identifiers: *Information dissemination, *Motion pictures, *Technology transfer.

An application of motion picture communication to solving the problem of communicating water research results to the public is described. Communication theory was applied to motion picture production for use in an information dissemination program for water resources. A documentary film, RIVERS, and a series of three news film clips on specific water research projects were produced and distributed via various channels to the general public. RIVERS was a visual essay of an important resource, streams, and was produced to be of interest to all segments of the public. Three film clips were produced to inform the public about specific types of water research being conducted by various scientists and how that research related to the quality of life. These films used different types of film style to accomplish their specific objectives. Taken together, they represent a comprehensive approach to solving the problem of communicating with the general public using film. (See also W77-01191)
W77-05102

GENESEE COUNTY PARKS AND RECREATION STUDY,
Michigan State Univ., East Lansing. Dept. of Park and Recreation Resources.
L. W. Moncrief, and R. E. Manning.
Michigan Agricultural Experiment Station, East Lansing, Research Report 272, October 1975. 14 p, 31 tab.

Descriptors: *Parks, *Surveys, *Recreation demand, *Financing, Recreation facilities, Social participation, Use rates, Management, Planning, *Michigan.
Identifiers: Genesee County(Mich).

A three-phase survey of park users, the general population, and community leadership, was used to gather information on which to base future management of the Genesee County park system. Survey results showed that the general citizenry was fairly satisfied with the system. Five areas were consistently mentioned as priority needs: swimming or water sports areas, sports facilities, trails for walking and biking, camping areas, and children's activity areas. More than one-half of all county residents appeared to be using the parks but very significant differences existed between different age groups and locations within the county. Less than 13% of all park users were non-county residents. While results were not definitive, racial or ethnic conflicts appeared to play a role in people's attitudes towards the park system. County residebnts overwhelmingly favored supporting a park and recreation program with public tax monies but less than half of the registered voters indicated willingness to increase the mill rate at that time, supporting up to a 3/4 mill. Entrance fees or user charges were favored as an alternative to tax increases for increased future financing by 70% of the registered voters. Both park users and registered voters favored the development of existing parks as opposed to parkland acquisition for future development. Recommendations for generating support for increaded tax support of county parks based on these surveys are also discussed. (Luedtke-Wisconsin)
W77-05214

FINANCING WATER DEVELOPMENT PROGRAMS IN AN ECOLOGICAL AGE,
Denver Water Dept., Colo.
J. L. Igilvie.
Journal American Water Works Association, Vol 68, No 2, p 93-96, 1976.

Descriptors: *Financing, *Bond issues, *Political constraints, Political aspects, Water resources development, *Colorado, Non-structural alternatives, *Attitudes, *Social participation.
Identifiers: *Public relations, *Denver(Colo), Public opinion sampling, Public information programs, Voter response, Public education programs.

A public education program is described which was utilized to inform the public in Denver (Colo.) about the critical need to pass a $160 million bond issue in support of financing for a 12-year, $385 million capital improvement program for water utilities and other needs. The 16-month public involvement program was launched by the Denver Water Board after voters narrowly rejected a $200 million bond issue in an earlier election. To begin, a general brochure was printed and distributed describing the history and present operation of the water utility. Next, 35 members were chosen for a capital improvements advisory committee to represent both political parties, minority groups, civic and environmental organizations, business and labor and senior citizens. Six formal 2-3 hour meetings were scheduled to explain the issues to the public, and alternative courses of action were soiicited from the advisory committee. The water board also appealed to civic and community organizations to schedule speakers for various public meetings, and numerous groups responded. Large newspaper advertisements were published twice before the election, and the names of hundreds of supporters were published. In addition, public opinion polls were used extensively to sample opinion around the Denver metropolitan area and to pinpoint neighborhoods and groups where additional public relations efforts were needed. (Harris-Wisconsin)
W77-05218

METHOD FOR EVALUATING IRRIGATION PROJECTS,
Economic Research Service, Washington, D.C. Natural Resource Economics Div.
For primary bibliographic entry see Field 3F.
W77-05237

UNCERTAINTY AND PLANNING FOR WATER POLLUTION CONTROL,
Toronto Univ. (Ontario). Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5G.
W77-05253

A REVIEW OF RECENT EXTENSIONS OF LINEAR ECONOMIC MODELS TO REGIONAL ENVIRONMENTAL QUALITY ANALYSIS,
Harza Engineering Co., Chicago, Ill.
J. A. Gibson.
Journal of Environmental Systems, Vol. 6, No. 2, p 147-172, 1976-77. 2 tab, 20 ref.

Descriptors: *Environmental effects, *Regional analysis, *Comprehensive planning, *Model studies, *Input-output analysis, *Linear programming, Alternative planning, Economics, Evaluation, Ecology, Water utilization, Cost-benefit analysis, Land use, Optimization, Equations, Systems analysis.
Identifiers: *Environmental quality, Second generation models, General equilibrium approach, Marine economic commodities, Cost minimization.

Regional economic planning can no longer be primarily concerned with the regional economy and its development; it also must take cognizance of the effect of economic development on the natural environment. This expansion of regional planning necessitates the development of new tools and methodologies for evaluating alternatives. This paper selectively reviews recent extensions of input-output and linear programming models to include a regional environmental quality component. Considered are: a general equilibrium approach to environmental quality analysis; the extension of input-output models to regional environmental quality analysis, including the Leontief model, the Charleston Metropolitan Region study, the Victor model, and the Isard model; and Russell and Spofford's linear progrmming politico-Pollution model. These models stress the need for synthesis of physical environment and design, social, political and other cultural factors. Since these models do not provide any objetive basis for defining the optimum balance between pecuniary economic growth and environmental quality, optimum level will depend upon the value system of the people. (Bell-Cornell)
W77-05254

ECONOMIC TRADE-OFFS TO LIMIT NON-POINT SOURCES OF AGRICULTURAL POLLUTION,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5G.
W77-05255

IMPACTS OF STATE LAND USE AND ENVIRONMENTAL REGULATIONS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 6G.
W77-05256

DISASTER RECOVERY PLANNING REPORT.
Pennsylvania Office of State Planning and Development, Harrisburg.
For primary bibliographic entry see Field 6F.
W77-05293

UPPER JAMES RIVER BASIN WATER QUALITY MANAGEMENT PLAN.
Wiley and Wilson, Inc., Lynchburg, Va.
For primary bibliographic entry see Field 5G.
W77-05294

THE GALLATIN AREA; A SUMMARY REPORT,
Montana State Univ., Bozeman.
J. J. Jezeski, and J. W. Reuss.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 985, Price codes: A03 in paper copy, A01 in microfiche. Bulletin No. 344. February 1974. 36 p, 28 fig, 2 tab, photos. RANN GI-38, GI-29908X1, GI-39592.

Descriptors: *Legislation, *Wildlife, *Land use, *Population, *Economic aspects, *Land, *Urbanization, *Air quality, *Water quality, *Recreation, Employment, Agriculture, Traffic, Income, Costs, *Montana.
Identifiers: *Gallatin Canyon(Mont), Gallatin County(Monta), Community services, *Big Sky Development(MT).

This summary of what has happened and what might happen in the Gallatin area stresses that change will take place and that citizens need to plan for the area's future. Data collected since 1970 when annoncement was made of plans for developing Big Sky resort in Gallatin Canyon and other county data are the basis for the report. Emphasis is placed on the importance of land use decisions as they affect Gallatin County. Prime agricultural land is beng converted to residential use in the Bozeman area. This trend is expected to continue with rural areas increasingly being used for vacation homes and resorts. Most mountain valleys are subject to some air pollution during temporary thermal inversions. Water quality is presently good. The only regulations or control over areas to be developed is the State Department of Health sanitary regulations on water supply and sanitrary disposal of waste; these restrictions must be lifted if developed land is to be used. Wildlife, and important recreation, needs a sound management program. Economic resources must be balanced to combine wildlife, recreation, agriculture and lumbering. The impact of development on public cost and income is schematically analyzed. A summary of pertinent Montana legislation is given. (Gentry-NC)
W77-05295

A REVIEW AND ANALYSIS OF ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGIES,
Construction Engineering Research Lab. (Army), Champaign, Ill.
For primary bibliographic entry see Field 6G.
W77-05296

INLAND LAKES WATER QUALITY AND WATERSHED PLANNING: REMOTE SENSING TECHNOLOGY APPLICATIONS,
Michigan Environmental Research Inst., Ann Arbor.
T. Borton, C. T. Wezernak, and R. K. Raney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 620, Price codes: A09 in paper copy, A01 in microfiche. Prepared for the National Science Foundation, Report NSF-RA-E-75-036, June 1975. 188 p, 48 fig, 24 tab, 21 ref, 6 append. GI-34809X1.

Descriptors: *Remote sensing, *Spectroscopy, *Infrared radiation, Photography, *Decision making, *Information exchange, Water resources, *Eutrophication, Lakes, *Michigan, Mapping, Measurement, Watersheds(Basins), Planning, *Watershed management, Water quality.
Identifiers: Fenton Township(MI), Genesee County(MI), Opinion leaders, Inland lakes.

Three lakes in Fenton Townships, located in Genesee County (MI), were the subject of a case study to test the utility and impact of remote sensing information on local decision making. The

study sought to analyze the present sources and flow of information within and between agencies and assess the influence of the introduction of remote sensing information. Salience, credibility and continuity were elements of a program designed to develop a transfer and dissemination process for technologically derived information. Recommendations for a local information dissemination program include: (1) remote sensing should be oriented to solve current, visible problems; (2) a network of opinion leaders and organizations should be used for communicating remote sensing information; (3) currently operating agencies and interest groups should coordinate remote sensing information with local decision makers. Remote sensing techniques tend to stimulate interest among local residents and provide continuous information, thus encoraging public comment. Some problems with the technique are an inability to maintain scale uniformity of mapping, dependence on good weather conditions, and limited availability of processing facilities. A remote sensing eutrophication index is proposed for lake classification and change detection. As the number and size of lakes to be monitored for environmental quality increase and as the shoreline and watershed are important factors, remote sensing more adequately provides a data base for water resource management and environment planning. (Gentry-NC)
W77-05297

CONSUMER EVALUATION OF THE QUALITY AND COST OF DOMESTIC WATER,
California Univ., Berkeley, School of Public Health.
For primary bibliographic entry see Field 5G.
W77-05371

A RESOURCE PLANNING PROCESS FOR GEORGIA'S COAST,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 6G.
W77-05391

COASTAL DEVELOPMENT AND AREAS OF ENVIRONMENTAL CONCERN,
North Carolina State Univ., Raleigh. Sea Grant Advisory Services.
For primary bibliographic entry see Field 2L.
W77-05402

STANDARDS RELATED TO WATER-ORIENTED AND WATER-ENHANCED RECREATION IN WATERSHEDS - PHASE I,
Pennsylvania State Univ., University Park. Dept. of Recreation and Parks.
B. van der Smissen, and M. L. Christiansen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 695, Price codes: A08 in paper copy, A01 in microfiche. Research Publication 92, Institute for Research on Land and Water Resources, University Park, PA., December 1976. 146 p., 96 ref. OWRT A-033-PA(1). 14-31-0001-5038.

Descriptors: *Standards, *Recreation, *Watershed management, *Planning, *Pennsylvania, Water skiing, Swimming, Skiing, Scuba diving, Beaches, Ice skating, Hunting, Fishing, Camp sites, Boating.
Identifiers: *Water-oriented recreation, *Water-enhanced recreation, *Outdoor recreation, Tobogganing, Surfing, Sightseeing, Power boating, Picnicking, Sailing, Walks, Hikes, Horseback riding, Coasting, Canoeing, Bicycling, Snowmobiling.

This report concerns standards related to water-oriented and water-enhanced recreation in Pennsylvania watersheds; however, the substantive content is generally applicable to outdoor recreation planning. The report is a review of literature setting forth planning and development guidelines and environmental and support requirements for 25 recreation activities. More than 100 sources were identified, reviewed, analyzed, and summarized in relation to outdoor recreation which is water-enhanced or water-oriented. The review has three aspects: summary commentary; the presentation of all guidelines and requirements identified with reference documentation for the 25 activities; and listing of references with indication of information type contained in each related to the topic of the study. (Sink-Penn State)
W77-05484

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

AIR POLLUTION CONTROL COSTS AND CONSUMPTION PATTERN EFFECTS. A REGIONAL ANALYSIS,
Drexel Univ., Philadelphia, Pa. Coll. of Business Administration.
For primary bibliographic entry see Field 5G.
W77-05215

FINANCING WATER DEVELOPMENT PROGRAMS IN AN ECOLOGICAL AGE,
Denver Water Dept., Colo.
For primary bibliographic entry see Field 6B.
W77-05218

OPTIMIZATION OF WATER PUMPING COSTS BY HIERARCHICAL METHODS,
Sheffield Univ. (England). Dept. of Control Engineering.
M. J. H. Sterling, and B. Coulbeck.
Proceedings of the Institution of Civil Engineers, Vol. 59, Part 2, p 789-797, December 1975. 1 fig, 1 tab, 5 ref.

Descriptors: *Water supply, *Pumping, *Optimization, Economic efficiency, Cost comparisons, Networks, Control, Electricity, Equations, Water demand, Operating costs, Tariff, Computer models, Constraints, Reservoirs, Systems analysis.
Identifiers: Cost minimization, Lagrange duality theory, *Hierarchical optimization technique, Linear difference equation.

Increasing sizes and operating costs of water supply systems make it essential to have rigorous, easily applicable optimization methods. This paper describes modifications to a previously-developed hierarchical optimization method; these improvements make the method more applicable for evaluating optimal control decisions taking into account all relevant factors. In particular, methods have been devised for the optimization of electricity maximum demands and to make it possible to compare electricity unit and demand changes accurately. The optimization formulation is based on Lagrange duality theory and its solution is derived by a two-level hierarchical method. The method developed has been applied to a simple water supply system and the results show that desirable operational features have been achieved which would result in a reduction of operating cost under continuously variable pumping capability. (Bell-Cornell)
W77-05245

MINIMUM COST DESIGN USING A PRE-PLANNED NODAL SEARCH METHOD,
For primary bibliographic entry see Field 4A.
W77-05246

CONSUMER EVALUATION OF THE QUALITY AND COST OF DOMESTIC WATER,
California Univ., Berkeley, School of Public Health.
For primary bibliographic entry see Field 5G.
W77-05371

EVALUATION OF MULTI-PURPOSE OFFSHORE INDUSTRIAL-PORT ISLANDS: GENERAL ISLAND CHARACTERISTICS.
Delaware Univ., Newark, Coll. of Marine Studies.
For primary bibliographic entry see Field 5G.
W77-05377

6D. Water Demand

RURAL RESIDENTIAL WATER DEMAND: AN ECONOMETRIC AND SIMULATION ANALYSIS,
Kentucky Univ., Lexington. Dept. of Agricultural Economics.
O. C. Grunewald, C. T. Haan, D. L. Debertin, and D. I. Carey.
Water Resources Bulletin, Vol. 12, No. 5, p 951-961, October 1976. 2 fig, 4 tab, 13 ref. OWRT A-052-KY(3).

Descriptors: *Water supply, *Water demand, *Simulation analysis, *Economics, Pricing, Water policy, Management, Water utilization, Rural areas, Reservoirs, Mathematical models, Equations, Systems analysis.
Identifiers: *Residential water.

This study proposes that demand management through pricing policies can be used in conjunction with supply management to solve water supply problems. Economic principles are shown to apply to rural residential water use. A demand function for water was developed based on cross-sectional water use data collected in Kentucky. Price was found to be a significant determinant of the quality of water demanded. A constant price elasticity of -0.92 was found. The demand function as used in a simulation analysis to determine reservoir capacity needed to supply water needs of a rural community. The simulation revealed that price can significantly affect required reservoir storage. (Bell-Cornell)
W77-05187

GENESEE COUNTY PARKS AND RECREATION STUDY,
Michigan State Univ., East Lansing. Dept. of Park and Recreation Resources.
For primary bibliographic entry see Field 6B.
W77-05214

A MULTINOMIAL ANALYSIS OF WATER DEMAND,
Building Research Establishment, Watford (England).
R. G. Courtney.
Building and Environment, Vol 11, No 3, p 203-209, 1976. 5 fig, 10 tab, 6 ref, append.

Descriptors: *Water demand, *Flow rates, *Water supply, *Water distribution(Applied), *Probability, Design flow, Pipes, Data collections, Monitoring, Outlets, Equations, Computer programs, Water utilization, Systems analysis, *Forecasting.
Identifiers: *Multinomial analysis.

Presented is a new approach for predicting the flow rates in water supply systems based on an analysis of the combinations of outlets simultaneously in use in each dwelling and on the application of the multinomial probability distribution. This approach does not require uses within a dwelling to be independent but still requires independence between dwellings. The method is used to predict peak flow rates in each supply system (hot, cold, and drinking water) for different sized groups of apartments, and the total water demand of the apartments is similarly predicted. It is often cheaper and easier to monitor outlet usage rather than flow rates, although flow rates provide superior data if the same size sample of users can be covered. In either case, multinomial distribution can be used to predict combined flows. The

method is well suited to the synthesis of combined demand on building services from a group of users. Other possible applications would be, for example, in the design of electrical systems, drainage services, and communal heating schemes. (Bell-Cornell)
W77-05244

HYDROLOGY AND WATER RESOURCES OF THE CHARLES RIVER BASIN, MASSACHUSETTS,
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-05280

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, JOHN DAY DRAINAGE BASIN.
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W77-05285

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, DESCHUTES DRAINAGE BASIN.
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W77-05286

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS. HOOD DRAINAGE BASIN,
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W77-05298

OREGON'S LONG-RANGE REQUIREMENTS FOR WATER. GENERAL SOIL MAP REPORT WITH IRRIGABLE AREAS, WILLAMETTE DRAINAGE BASIN,
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W77-05299

MARKET DEMAND AND GENERAL LOCATION OPTIONS,
Texas A and M Univ., College Station. Industrial Economics Research Div.; and Delaware Univ., Newark. Dept. of Business Administration.
D. M. Bragg, N. C. Whitehorn, and B. G. Schmidt.
In: 'Evaluation of Multi-Purpose Offshore Industrial-Port Islands: General Island Characteristics', Delaware Univ. Final Tech. Rept. to NSF-RANN, No. NSF-RE-E-75-054A, p 1-169, May 1975. 38 fig, 44 tab, 81 ref. GI-43111.

Descriptors: Resources development, *Marketing, *Industries, Islands, Electric powerplants, Fertilizers, *Demand.
Identifiers: *Outer Continental Shelf, *Resources management, Site selection, Siting, Artificial islands, Artificial ports, Petroleum refining, Petrochemical manufacturing, Deepwater terminals, LNG regasification, Urban solid waste processing, Paper manufacturing.

Serious consideration of offshore artificial islands as locations for various service and heavy industrial facilities must start with an examination of several industry sectors in order to make a reasonable determination of the most likely candidates for island occupancy. Attention must also be directed to the social, economic and physical conditions existing in each geographical region under consideration to determine how these interact with the social, economic and physical characteristics of each sector of industry to be a candidate for artificial island location in a particular geographic region. It was found that an industry which might be a candidate on the East or Gulf coast was not always a candidate on both coasts due to significant differences in economic, environmental and social conditions in the two areas. Among the many sectors of industry which were reviewed, eleven significant ones were studied in detail. These are: petroleum refining; petrochemicals manufacturing; electric power generation; deepwater terminals; liquefied natural gas (LNG) regasification; urban solid waste processing and disposal; fertilizer manufacturing; and paper manufacturing. (See also W77-05377) (Sinha-OEIS)
W77-05378

PROCESS DESCRIPTION AND ADAPTATION STUDY,
Gilbert/Commonwealth Associates, Reading, Pa.
For primary bibliographic entry see Field 5G.
W77-05379

WERRIBEE RIVER BASIN: PROPOSALS FOR WATER RESOURCES MANAGEMENT,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
For primary bibliographic entry see Field 4A.
W77-05524

WATER RE-USE IN JAPAN,
Water Reuse Promotion Centre, Tokyo (Japan).
For primary bibliographic entry see Field 5D.
W77-05528

6E. Water Law and Institutions

DEEP SEABED MINING (HEARINGS ON HR 1270, HR 6017, HR 11879 TO PROMOTE ORDERLY CONSERVATION AND DEVELOPMENT OF THE MINERAL RESOURCES OF THE DEEP SEABED).
Hearings--Subcommittee on Oceanography--Committee on Merchant Marine and Fisheries, U.S. House of Representatives, May 16, 1975, February 23, 24, March 8, 9, 1976, Serial No 94-27. 575 p.

Descriptors: *Mining, *Law of the Sea(LOS), *International law, *Treaties, Mineralogy, Nickel, Cogalt, Manganese, Copper, Oceans, Water law, Navigation, Fish, Fishing, Commercial fishing, Environment, Marine geology, Resources, Natural resources, Oil, Mineral industry.
Identifiers: *Deep seabed mining, *Minerals, *Law of the Sea(LOS) Conference, *Marine resources.

During the 1975 and 1976 sessions of the International Law of the Sea (LOS) Conference, bills were proposed to allow for exploitation of minerals in the deep seabed by the United States prior to conclusive agreement of the LOS Conference. These committee hearings considered viewpoints in favor of and in opposition to the proposed legislation. Of primary consideration was the issue whether unilateral action by the United States would be detrimental to the reaching of an agreement by the other nations or would facilitate a more rapid agreement. Also discussed were: whether such action would be in contravention of international law, and if there is in fact international law in this area; whether it is in the best interests of the United States to proceed independently, or by agreement with selected other nations, or to delay any seabed mining until an accord is reached by the LOS Conference. The hearings also considered whether an accord might be reached at all. Included in the report is testimony by representatives of environmental and private public interest groups, corporations with an interest in seabed mining, and officials of United States Cabinet departments and regulatory agencies. (Sloan-Florida)
W77-05209

ENCOURAGEMENT OF PUBLIC FUNDING, INVOLVEMENT, AND SUPPORT OF URBAN WATER RESOURCES PROJECTS,
Engineering-Science Inc., W. E. Gates and Associates, Inc., McLean, Virginia.
W. E. Gates, K. R. Smith, and R. M. Males.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 358, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, December 1974. 135 p, 1 fig, 7 ref, 2 append. OWRT C-3196(3700)(3). 14-31-0001-3700.

Descriptors: Urbanization, Regional development, Decision making, Attitudes, Institutions.
Identifiers: Public involvement, Public participation, Mass media.

This report describes the philosophy, methods, and techniques of developing a public involvement program in an urban or regional water resource management agency. It is developed to be a handbook, for use by senior agency officials, as an aid to developing their programs. Included in the report are considerations of: setting agency objectives for public involvement; description of the characteristics of specific media; problems of scheduling, resources, format, budget, and organization; target populations for public involvement programs; and a description of four 'media modules' which can be used to organize the public involvement program. The report is based on actual experience in the conduct of a major public involvement program, and emphasis is on the realities of public involvement from the agency point of view.
W77-05213

ISSUES AND INNOVATIONS IN ENVIRONMENTAL POLICY IN BRITAIN, WEST GERMANY, AND CALIFORNIA,
California Univ., Berkeley. Inst. of Governmental Studies.
For primary bibliographic entry see Field 6G.
W77-05216

THE NEW EQUITY IN THE LAW OF THE SEA,
Dalhousie Univ., Halifax (Nova Scotia). Marine and Environmental Law Program.
D. M. Johnston.
International Journal, Vol 8, No 14, p 79-99, 1976. 18 ref.

Descriptors: *United Nations, *Law of the sea, *International law, *Oceans, *International waters, *Jurisdiction, Governments, Foreign counties, Water law, Legal aspects, International commissions, Continental shelf, Equity.

A proposal is made that the new law of the sea for the late 20th century should accommodate all reasonable demands for equity and efficiency in the emerging world community, wherein the nation-states and other major actors in the international system have a common need to comply with substantially similar or compatible norms and to resort to an accepted range of organized procedures. For reasons of equity, sea law should reflect a sensitive response to a readjusted assortment of legitimate value demands, using the current revision as the Third United Nations Conference on the Law of the Sea (UNCLOS III) as a law reform movement. For the sake of efficiency, sea law should provide innovative and constructive techniques in the new applied science of 'ocean management.' The most significant feature of UNCLOS III, as described in the article, is recommendation of a uniform and massive extension of coastal state jurisdiction out as far as 200 miles. Various legal developments would confer

extended authority on five classes of nations: (1) coastal states; (2) narrow margin states; (3) very broad margin states; (4) states in special geographical circumstances, and (5) states with a special environmental vulnerability. Finally, important access guarantees would be given to land-locked states. (Harris-Wisconsin)
W77-05219

LEGAL/POLITICAL ASPECTS,
Delaware Univ., Newark. Center for the Study of Marine Policy.
G. J. Mangone, J. T. Bockrath, S. Truver, and J. Homer.
In: 'Evaluation of Multi-Purpose Offshore Industrial-Port Islands: General Island Characteristics', Delaware Univ. Final Tech. Rept. to NSF-RANN, No. NSF-RE-E-054A, p 432-484, May 1975. 1 tab.

Descriptors: *Coasts, *Political aspects, *Legal aspects, *Resources development, Water resources.
Identifiers: *Outer Continental Shelf, *Artificial islands, *Artificial ports, *Resources management, Energy resources.

The construction of artificial islands off the coasts of the United States must take place within a framework of state, federal, and international law. Some guidance to the applicable law can be obtained from existing U.S. and state statutes that cover various activities in territorial waters and in the high seas beyond, as well as on the continental shelf. This study examines (a) general legal considerations relating to artificial islands; (b) the pertinent federal statutes and international law; (c) state legislation relating to artificial islands; (d) specific legal issues for the operation of artificial islands; and (e) contemporary political issues in the licensing and supervision of artificial islands. (See also W77-05377) (Sinha-OEIS)
W77-05382

IMPLEMENTATION OF THE COASTAL AREA MANAGEMENT ACT,
North Carolina Univ. at Chapel Hill. Urban Services Center for Urban and Regional Studies.
D. J. Brower.
In: Coastal Development and Areas of Environmental Concern, Proceedings of Symposium held Greenville, NC on March 5, 1975. North Carolina University Sea Grant Report No. UNC-SG-75-18, September 1975. 1 ref.

Descriptors: *North Carolina, *Coasts, *Resources development, *Natural resources, *Local governments, *State governments, *Jurisdiction, Conservation, Public rights, Estuaries, State jurisdiction.
Identifiers: *Resources management, *Environmental concern, *Coastal zone management, Public interest.

The General Assembly enacted the Coastal Area Management Act of 1974 not to stop development in the coastal area but to insure that development that does take place is in harmony with the coastal environment and the ecological processes that govern it. The three potential problems that arise out of the relationship between the Coastal Resource Commission's position as an agency of state government presumably reflecting a state perspective and the local jurisdictions who must adopt implementing regulations which will reflect a local perspective. The extent to which these two perspectives can be melded into a solid working statement of policy will, in large measure, control the extent to which the Act is successful in achieving its objectives and in withstanding legal assault. (See also W77-05402) (Sinha-OEIS)
W77-05413

6F. Nonstructural Alternatives

REORIENTATION OF URBAN-RELATED WATER RESOURCES RESEARCH,
Rutgers - The State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 3D.
W77-05188

WAPSIPINICON RIVER AND MALONE CREEK FLOOD PLAIN INFORMATION, INDEPENDENCE, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-05284

MISSISSIPPI RIVER FLOOD PLAIN INFORMATION, MILE 506.9 TO MILE 549.4.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-05287

KISHWAUKEE RIVER FLOOD PLAIN INFORMATION, WINNEBAGO COUNTY, ILLINOIS.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-05288

FLOOD PLAIN INFORMATION REPORT, SKUNK RIVER AND SQUAW CREEK, STORY COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-05289

FLOOD PLAIN INFORMATION REPORT, DUCK CREEK, SCOTT COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-05290

DISASTER RECOVERY PLANNING REPORT.
Pennsylvania Office of State Planning and Development, Harrisburg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 677, Price codes: A08 in paper copy, A01 in microfiche. Prepared for the U.S. Department of Housing and Urban Development, Washington, D.C., Final Report, June 1975. 151 p, 1 fig, 15 tab, 10 map, appeend. HUD-CPA-PA-1050, and ARC-PA-2355/73-85.

Descriptors: *Floods, Flooding, *Flood control, *Comprehensive planning, *Decision making, *Economic impacts, *Pennsylvania, Flood plain insurance, Flood plains, Storms, Information retrieval, Institutions, *Disasters.
Identifiers: *Hurricane Agnes, *Flood plain management, *Economic aspects, Governor's Flood Action Center(PA), *Disaster recovery, Flood recovery.

The design of disaster recovery planning in Pennsylvania received significant impetus from Hurricane Agnes (June 1972) which is included in this report as a case study. Recovery planning, as conceived by the Pennsylvania Office of State Planning and Development (OSPD), is to work toward the long term revitalization of the State economy and should coordinate emergency and temporary relief activities. There was a lack of adequate data concerning both pre- and post-disaster conditions, and in order to assess recovery needs and priorities OSPD established the Governor's Flood Action Center to compile data. The Center functionally served as a citizen advocate agency for disaster related problems and it also monitored expressed needs and impressions of relief effectiveness. Indexes were established to allocate funds geographically; this included Office of Emergency Preparedness municipal reimbursements and disaster loans made by the Small Business Administration and Farmers Home Administration. No satisfactorily rigorous decision process was found to select specific disaster recovery projects. Because of these inadequacies OSPD concluded that its role in planning disaster recovery should be to emphasize flood plain management, analyze economic sectors and industries on which flooding has substantial direct and indirect impact, and to relate disaster recovery with comprehensive planning (i.e., coordinating various state programs, public participation). (Gentry - NC)
W77-05293

FLOOD PLAIN INFORMATION: SAND AND SLATE CREEKS, NEWTON, KANSAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W77-05300

FLOOD PLAIN INFORMATION: LOTTS CREEK AND MILL CREEK, CITY OF STATESBORO, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W77-05301

FLOOD PLAIN INFORMATION: NORTH PLATTE RIVER, SCOTTSBLUFF, NEBRASKA.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-05302

FLOOD PLAIN INFORMATION: AGUA FRIA RIVER, MARICOPA COUNTY, ARIZONA,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W77-05303

WERRIBEE RIVER BASIN: PROPOSALS FOR WATER RESOURCES MANAGEMENT,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
For primary bibliographic entry see Field 4A.
W77-05524

6G. Ecologic Impact Of Water Development

OIL AND GAS USE CHARACTERIZATION, IMPACTS, AND GUIDELINES,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
W. H. Conner, J. H. Stone, L. M. Bahr, V. R. Bennett, and J. W. Day, Jr.
Sea Grant Publication No. LSU-T-76-006, June 1976. 157 p, 13 fig, 13 tab, 136 ref.

Descriptors: *Louisiana, *Wetlands, *Oil industry, *Oil pollution, *Salts, *Sulfur, *Resources development, *Baseline studies, *Environmental effects, Coasts, Exploration, Exploitation, Gulf of Mexico.
Identifiers: *Outer Continental Shelf, Coastal zone, Barataria Basin, Coastal zone management.

A nontechnical survey of oil and gas activities and their impacts on wetland, and a discussion of preliminary guidelines for optimizing production and minimizing impact are presented. Data, techniques, and methodologies for assessing impacts and specific guidelines are insufficient at this time to go beyond identification and generalization of major activities. The presence of the oil and gas production industry is pervasive in the Barataria Basin, the drainage basin of swamp and marsh that lies between the natural levee systems of the Mississippi River and Bayou Lafourche. In addition to petroleum production, the sulfur and salt resources of the area are important. It is recognized by citizens that mineral extraction and com-

mercial fishing are the most important present and future activities in the coastal regions. (NOAA)
W77-05134

THE IMPACTS OF OUTER CONTINENTAL SHELF DEVELOPMENT ON LAFOURCHE PARISH,
New Orleans Univ., La. Urban Studues Inst.
A. J. Mumphrey, Jr., F. W. Wagner, G. D. Carlucci, Jr., M. J. Landry, and J. C. Miller, Jr.
Report to Louisiana State Planning Office, (Baton Rouge), August 1976, 391 p. LA SPO-76-14.

Descriptors: *Louisiana, *Resources development, *Oil industry, *Baseline studies, *Environmental effects, *Wetlands, Water resources, Mining, Employment, Income, Economic analysis, Coasts, Recreation facilities, Gulf of Mexico.
Ide. ifiers: *Outer Continental Shelf, Gas industry, Support facilities, Energy resources.

The impacts of OCS mining activity on Lafourche Parish are examined in terms of employment, income, job types, environmental effects, and required supporting facilities and services. Information on popultation, employment and income in Lafourche Parish is presented as well as an elaboration and description of the various job types involved in mining--exploration, drilling, production, and pipe laying--and in related industries--water transportation, boat building and heavy construction. The mining industry has had uneven impacts, both positive and negative, on seafood, fur and creation. The tax base of Lafourche Parish which is heavily based on the oil and gas industry is discussed. The infrastructure of Lafourche Parish, both existing and planned--highways, canals, airports, electrical power facilitis, pipelines, vocational schools and port facilities--are discussed with the dominant impression that for all facilities except electrical power and pipelines, supply has not caught up with demand generated over time by oil and gas activity. (NOAA)
W77-05136

A PROCESS FOR COASTAL RESOURCE MANAGEMENT AND IMPACT ASSESSMENT,
Coastal Environments, Inc., Baton Rouge, La.
Report to Louisiana State Planning Office, (Baton Rouge), Coastal Resources Program, August 1976, 72 p.

Descriptors: *Resources development, *Baseline studies, *Environmental effects, *Ecosystems, Coasts, Management, Land use, *Louisiana, Energy, Gulf of Mexico.
Identifiers: *Outer Continental Shelf, Resources management, *Environmental impact, *Coastal zone management, *Energy resources, Renewable resources.

While the report is specifically concerned with the assessment of on-shore impacts from offshore development, the basic framework for making decisions and evaluating impacts is common to all development proposals. Although offshore development may introduce some specialized impacts, such as those resulting from pipelines, other impacts arise from general developments, such as housing, industry, and drainage canals supporting offshore activities. Essentially, a management and planning approach is outline with OSC-related activity as an appropriate example for assessment. A background for understanding resource management; an overview of naturally occurring and man-made physical conditions that may be encountered in the Louisiana coastal area; a practical procedure for developing a local coastal resource management program; and a systematic approach to resouce management are presented. (NOAA)
W77-05137

A WATER QUALITY DATA REPORT OF THE COORDINATED MONITORING PROGRAM. METHODS AND DATA FOR 1974.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 2L.
W77-05208

ISSUES AND INNOVATIONS IN ENVIRONMENTAL POLICY IN BRITAIN, WEST GERMANY, AND CALIFORNIA,
California Univ., Berkeley. Inst. of Governmental Studies.
W. Solesbury.
Policy Analysis, Vol 2, No 1, p 1-38, 1976. 25 ref.

Descriptors: *Environmental control, *California, *Institutional constraints, *Political constraints, *Water policy, *Decision making, Governments, Legislation, Planning, Institutions, Legal aspects, Political aspects, Leadership, Attitudes, Social aspects.
Identifiers: *United Kingdom, *West Germany, Problem identification and ranking, Public awareness.

A comparative study of environmental politics in California and Britain and to a lesser extent in Germany focuses particularly on processes by which new environmental issues come to be recognized and faced by government, and on characteristics of political institutions that sustain issue recognition and policy innovation in environmental affairs. Recommendations are made for improving environmental policy through institutional reform. Situations, issues and responses are defined in relation to policy-making for environment in all three governmental systems. In terms of ideas and institutions, fundamental differences arise: California is characterized by concern with resources, orientation to the future and independent activity of the three main government branches; Britain depends on consultative practices, resists change and has few judicial checks on the executive branch; Germany has faith in development and the public works tradition and like Britain, has separation of governmental powers less significant than in California. Particularizing processes by which environmental ideas are developed and sustained are traced: lobbying and campaigning, executive decision-making and judicial procedures. Generalizing processes in issues development include constitutions and rights, political ideologies, areawide advisory committees, and legislative procedures. A more prescriptive approach is called for in issue emergence, implying changes in the machinery and systems of government among the three regions. (Harris-Wisconsin)
W77-05216

A REVIEW OF RECENT EXTENSIONS OF LINEAR ECONOMIC MODELS TO REGIONAL ENVIRONMENTAL QUALITY ANALYSIS,
H rza Engineering Co., Chicago, Ill.
Fo primary bibliographic entry see Field 6B.
W77-05254

IMPACTS OF STATE LAND USE AND ENVIRONMENTAL REGULATIONS,
Iowa State Univ., Ames.
E. O. Heady, and V. S. S. V. Nagadevara.
Water, Air, and Soil Pollution, Vol. 5, No. 4, p 453-468, June 1976. 4 fig, 5 tab, 20 ref.

Descriptors: *Iowa, *Land use, *Water utilization, *Environment, *Regulations, *Crop production, *Regions, *States, Management, *Water allocation(Policy), Legislation, Water supply, Optimization, Demand, Costs, Efficiencies, Livestock, Constraints, Effects, Export, Marketing, Farms, Nitrogen, Fertilizers, Pesticides, Systems analysis, Mathematical models, *Environmental effects.
Identifiers: Impacts, Soil loss, Profit maximization.

Most states have or pose legislation to affect growth land use and environmental impacts. But it is possible that actions by a single state (or region) may have positive results in control of a resource use but negative impact on the state or region's income. This study is a quantitative test of the state or regional impact of land use and environmental regulations when the latter imposes resource use restraints but other states or rgions do not. The study applies to Iowa, one of a few states which has passed a specific land use act. Tight environmental controls in Iowa could have heavy impacts on national supplies and prices and on the distribution of farm income and asset values among states and locations. Examined is the income effect when soil loss per acre years is set at two upper limits. Examined also are cases in which nitrogen fertilizer and pesticides are restricted in use in Iowa but not elsewhere. The analysis is made at two export levels to determine differential effects under normal or extended export markets. Using a programming model seven alternative futures where restraints are applied in Iowa but not elsewhere are analyzed. The large scale model applies to all major resources, commodity, and producing regions of the U.S. The model has been used to select the cropping systems and conservation practices covering the soil loss or nitrogen restriction to be met, with profits otherwise maximized in each of these soil areas within each of the conservancy-producing areas. Optimization is in terms of most efficient production pattern for the nation in use of land and water resources when environmental improvement laws are enforced only in Iowa. (Bell-Cornell)
W77-05256

THE GALLATIN AREA; A SUMMARY REPORT,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 6B.
W77-05295

A REVIEW AND ANALYSIS OF ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGIES,
Construction Engineering Research Lab. (Army), Champaign, Ill.
R. K. Jain, and L. V. Urban.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A013 359, Price codes: A02 in paper copy, A01 in microfiche. Technical Report E-69 (CERL-TR-E-69), June 1975. 22 p, 1 fig, 1 tab, 25 ref.

Descriptors: *Methodology, Analytical techniques, *Environmental effects, Decision making, Technology, Reviews, Evaluation, Environment.
Identifiers: *Environmental management, *Environmental impact assessment, *Environmental impact statement, National Environmental Policy Act.

The National Environmental Policy Act requires environmental impact assessments and statements for federal actions having significant environmental impacts and for those federal actions having controversial impacts. In choosing and assessment methodology one should consider: (1) use (is the analysis a decision or information document.); (2) alternatives (are alternatives fundamentally or incrementally different.--fundamental alternatives shoud be measured by an absolute standard whereas a relative measure is applicable to incrementally different alternatives); (3) degree of public involvement in preparation and review; (4) resources required for analysis in terms of time, skills, money or data; (5) degree of familiarity so as to validate subjective analysis of impact; (6) significance of the issue; (7) administrative constraints. Methodologies are categorized into the following types: ad hoc, overlays, checklists, matrices, networks, and combination computer aided. Four problem areas should be included in a adequate environmental impact assessment: (1)

impact identification; (2) impact measurement; (3) impact interpretation; and (4) communicating impact information. The methodological techniques should be judged by standards of resource requirements, replicability and flexibility (such as scale flexibility, range or adaptability). Twenty currently used methodologies are described and evaluated in detail. (Gentry-NC)
W77-05296

HYDRODYNAMIC DAMPING AND 'ADDED MASS' FOR FLEXIBLE OFFSHORE PLATFORMS,
California Univ., Berkeley.
For primary bibliographic entry see Field 5G.
W77-05375

AQUEOUS SOLUBILITIES OF WEATHERED NORTHERN CRUDE OILS,
Toronto Univ. (Ontario). Dept. of Chemical Engineering and Applied Chemistry; and Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
For primary bibliographic entry see Field 5A.
W77-05376

EVALUATION OF MULTI-PURPOSE OFFSHORE INDUSTRIAL-PORT ISLANDS: GENERAL ISLAND CHARACTERISTICS.
Delaware Univ., Newark, Coll. of Marine Studies.
For primary bibliographic entry see Field 5G.
W77-05377

MARKET DEMAND AND GENERAL LOCATION OPTIONS,
Texas A and M Univ., College Station. Industrial Economics Research Div.; and Delaware Univ., Newark. Dept. of Business Administration.
For primary bibliographic entry see Field 6D.
W77-05378

PROCESS DESCRIPTION AND ADAPTATION STUDY,
Gilbert/Commonwealth Associates, Reading, Pa.
For primary bibliographic entry see Field 5G.
W77-05379

CIVIL ENGINEERING CONSIDERATIONS,
Harris (Frederick R.), Inc., Great Neck, N. Y.
For primary bibliographic entry see Field 8A.
W77-05380

ENVIRONMENTAL ASSESSMENT,
Delaware Univ., Lewes. Coll. of Marine Studies.
L. Watling, A. Pembroke, and H. Lind.
In: 'Evaluation of Multi-Purpose Offshore Industrial-Port Islands: General Island Characteristics', Delaware Univ. Final Tech. Rept. to NSF-RANN, No. NSF-RE-E-054A, p 294-431, May 1975. 82 ref, append.

Descriptors: *Environmental effects, *Resources development, Water resources, *Baseline studies, *Water pollution effects, Ecosystems, Ecology, Economics, Biota.
Identifiers: *Outer Continental Shelf, *Artificial islands, *Environmental assessment, Energy resources, U.S. Northeast Coast.

The impact of the construction and operation of an artificial island on the marine ecosystem of the northeastern United States was examined. While this could not be done directly, this study allowed: document what is presently known and what needs to be known about this region; discuss what is known about the components of the system and the reaction of these components to pollutant additives so far as that has been determined; and finally, to develop criteria and recommendations to govern this kind of activity such that both the ecological system and the economic system are maintained in a healthy state. Some biologically important aspects of the biota from the region Maine to Virginia are pointed out. It is not possible to offer a truly comprehensive view of this region due to the fact that levels of knowledge for the different biotic groups vary widely, and also, to the fact that the biota of the region is composed of several thousands of poorly documented species. (See also W77-05377) (Sinha-OEIS)
W77-05381

LEGAL/POLITICAL ASPECTS,
Delaware Univ., Newark. Center for the Study of Marine Policy.
For primary bibliographic entry see Field 6E.
W77-05382

THE BENTHIC FAUNA AND SEDIMENTS OF THE NEARSHORE ZONE OFF PANAMA CITY BEACH, FLORIDA,
National Marine Fisheries Service, Panama City, Fla. Panama City Lab.
For primary bibliographic entry see Field 2L.
W77-05386

EFFECTS OF DREDGING AND DISPOSAL ON SOME BENTHOS AT MONTEREY BAY, CALIFORNIA,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5C.
W77-05387

SAMPLING VARIATION IN SANDY BEACH LITTORAL AND NEARSHORE MEIOFAUNA AND MACROFAUNA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 2L.
W77-05388

A RESOURCE PLANNING PROCESS FOR GEORGIA'S COAST,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
L. F. Dean.
In: The Value and Vulnerability of Coastal Resources, Georgia Department of Natural Resources Report No. GADNR/OPR-75/1, p 1-7, May 1975.

Descriptors: *Georgia, *Resources, *Baseline studies, *Coasts, *Resources development, Water resources, *Environmental effects, Value, Management, Planning, Beaches, Dunes, Sand bars.
Identifiers: *Coastal zone management.

The purpose of these background papers is to highlight important characteristcs of Georgia's coastal resource features and systems including resource values and vulnerabilities. Management programs must be based upon an understanding of resource values and vulnerabilities and therefore a major purpose of this report is to make information readily available to interested officials and citizens. These papers summarize more lengthy research reports and books, but contain selected bibliographies for the reader interested in more detailed information about a particular subject. (See also W77-05390) (Sinha-OEIS)
W77-05391

THE VALUE AND VULNERABILITY OF COASTAL BEACHES, SAND DUNES, AND OFFSHORE SAND BARS,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 2L.
W77-05392

TERRESTRIAL ECOLOGY OF THE GEORGIA BARRIER ISLANDS,
Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W77-05393

THE VALUE AND VULNERABILITY OF FRESH WATER ECOSYSTEMS,
Georgia Inst. of Tech., Atlanta. Dept. of Zoology.
D. M. Gillespie.
In: The Value and Vulnerability of Coastal Resources, Georgia Department of Natural Resources Report No. GADNR/OPR-75/1, p 113-136, May 1975. 3 fig, 31 ref.

Descriptors: *Georgia, *Coasts, *Baseline studies, Resources, *Natural resources, *Resources development, *Freshwater, *Ecosystems, *Rivers, Channels, *Biological communities, *Environmental effects, Value, Water resources.
Identifiers: *Coastal zone management, *Environmental conditions, Vulnerabilities, Sport fishing.

This report is concerned with the major river systems, since these are ecologically most important in the area. These rivers fall into two types; those that rise in the coastal plain and those that rise in the piedmont. The former, which include the St. Marys and Satilla, are blackwater streams which are acidic and contain large amounts of humic acids and other dissolved organic matter, and are very low in other dissolved and soluble solids. The other rivers, which derive at least part of their flow from the piedmont, tend to be higher in dissolved solids, and are better buffered, thus much less acid. All, however, flow through extensive swampy areas and tend to be high in organic matter. Although these streams differ in some respects, they share many characteristics, and the values and vulnerabilities of their ecosystems are common to all. The fresh water ecosystem is a dynamically balanced sytem maintained by the interactions of physical and chemical environment with the flora and fauna of the biological community. It is vulnerable to any changes which disrupt these interactions. It is, however, a resilient system and capable of resisting and recovering from disturbances. (See also W77-05390) (Sinah-OEIS)
W77-05394

A SUMMARY OF GROUND WATER CONDITIONS COASTAL GEORGIA,
Georgia Dept. of Natural Resources, Atlanta. Earth and Water Div.
For primary bibliographic entry see Field 2L.
W77-05395

AN OVERVIEW OF COASTAL GEORGIA WILDLIFE,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 2L.
W77-05396

COASTAL GEORGIA'S CULTURAL RESOURCES,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
C. M. Howett.
In: The Value and Vulnerability of Coastal Resources, Georgia Department of Natural Resources Report No. GADNR/OPR-75/1, p 183-199, May 1975.

Descriptors: *Baseline studies, *Georgia, *Resources development, *Environmental effects, Resources, *Natural resources, *Coasts.
Identifiers: *Coastal zone management, *Environmental conditions, *Cultural resources.

Federal guidelines for the development of Coastal Zone Management programs encourages creative approaches to action, programs for orderly development, and preservation or restoration of areas within the coastal zone for their conserva-

tion, recreational, ecological, or aesthetic values. The effect of this legislation has been to demand that culturally significant sites be properly included in any consideration of the environmental resources of the coastal lands. Major historic and archaeological sites of natural significance or of special value to the history and culture of Georgia were classified in the first category of resources. This included the sand dunes of the barrier islands and endangered species of flora and fauna, which are vital to the integrity of the coastal area. (See also W77-05390) (Sinha-OEIS)
W77-05397

SOILS INFORMATION FOR COASTAL GEORGIA,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 2L.
W77-05398

VEGETATION INFORMATION FOR COASTAL GEORGIA,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 2L.
W77-05399

THE MARSHES,
National Park Service, Atlanta, Ga.
For primary bibliographic entry see Field 2L.
W77-05400

THE OPEN MARINE AND ESTUARINE WATERS,
National Park Service, Atlanta, Ga.
For primary bibliographic entry see Field 2L.
W77-05401

COASTAL DEVELOPMENT AND AREAS OF ENVIRONMENTAL CONCERN,
North Carolina State Univ., Raleigh. Sea Grant Advisory Services.
For primary bibliographic entry see Field 2L.
W77-05402

DESIGNATION OF AREAS OF CRITICAL STATE CONCERN IN OREGON,
Oregon Coastal Conservation and Development Commission, Salem.
G. J. Akins.
In: Coastal Development and Areas of Environmental Concern Proceedings of Symposium held Greenville, NC on March 5, 1975. North Carolina/Sea Grant University Report No. UNC-SG-75-18, Sept. 1975. p 1-15, 7 ref.

Descriptors: *Oregon, *Coasts, *Conservation, *Baseline studies, *Environment, Public rights, Land use.
Identifiers: *Resources development, *Environmental concern, *Coastal zone management, Environmental protection, Public interest.

Areas of Critical state concern are generally characterized as areas defined and designated by the state where uncontrolled or incompatible development could result in serious damage to the environment, life or property, or the long term public interest which is of more than local significance. The State of Oregon is presently about half as far into a critical areas process as it should be. Some basic elements of the process have been established, but the firm leadership necessary to make a critical areas process work is not yet evident. The coming year, however, should bring some major advances. The OCC&DC will present a recommended designation process to the legislature, which will also have to deal with a bill developed by the Oregon Environmental Council. The LCDC will undertake a more active review of other potential areas in the State. And, citizens throughout Oregon will undoubtedly begin forwarding requests for the designation of areas for a variety of reasons. By next year at this time, our perspective should be based more on experience, and less on speculation, than it is today. And perhaps at that time we can provide a more assured and explicit view on what is critical in Oregon. (See also W77-05402) (Sinha-OEIS)
W77-05403

EXTENT AND DISTRIBUTION OF AREAS OF ENVIRONMENTAL CONCERN IN NORTH CAROLINA,
North Carolina Dept. of Natural and Economic Resources, Raleigh.
A. W. Cooper.
In: Coastal Development and Areas of Environmental Concern Proceedings of Symposium held Greenville, NC on March 5, 1975. North Carolina University Sea Grant Report No. UNC-SG-75-18, p 16-22, September 1975. 1 fig.

Descriptors: *North Carolina, *Wetlands, *Conservation, *Baseline studies, Environment, Coasts, Public rights, Land use.
Identifiers: *Resource development, *Environmental protection, *Environmental concern, Coastal zone management, Public interest.

Areas of environmental concern in North Carolina are designed as coastal wetlands, estuarine waters, renewable resource areas, natural resources areas, public trust waters, hazardous areas and key facilities. Two types of coastal wetlands occur in North Carolina. Low tidal marshes, dominated by smooth cordgrass, are the dominant type of coastal wetland from the South Carolina line to Cape Lookout. These marshes are usually subject to regular inundation by lunar tides and typically are soft and muddy. Between 40,000 and 50,000 acres of these marshes still exist. Other coastal wetlands include marshes often called high tidal marsh and brackish marsh. Such marshes are dominated by black needlerush, sawgrass and cattail and occur in vast expanses behind the Outer Banks, along the entire fringes of the coastal sounds and in Currituck Sound. Although 150,000 acres of these marshes once existed, many have been modified by ditching and filling. (See also W77-05402) (Sinha-OEIS)
W77-05404

COASTAL SAND DUNES,
North Carolina State Univ., Raleigh. Dept. of Botany; and North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2L.
W77-05405

SCENERY FOR SALE,
North Carolina Univ. at Chapel Hill. Marine Sciences Curriculum.
A. C. Neumann.
In: Coastal Development and Areas of Environmental Concern, Proceedings of Symposium held Greenville, NC on March 5, 1975. North Carolina University Sea Grant Report No. UNC-SG-75-18, p 28-41, September 1975. 7 fig.

Descriptors: *North Carolina, *Barrier islands, Conservation, Shore protection, Tourism, Public rights.
Identifiers: *Environmental concern, *Resource management, *Coastal zone management, Public interest, Outer Banks(NC).

Man is so much a factor here that he must be considered as one of the dominant forces that now affects the shape, appearance and stability of these barrier islands. They are barriers to hurricanes and tempests, to the ravages of wind and waves and coursing tide..but at the hand of man they can crumble. Tourism on these islands is basically the selling or renting of scenery. Most people seek the beauty, wildness and privacy of the beach; so many people in fact that all three are being rapidly destroyed. Controls are needed, or else the scenery we sell or rent will be ruined by the very business of selling and renting. Urbanization enters when man becomes the dominant element of the scenery, and beauty, wildness and privacy leave. If scenery is what we have for sale we should jealously guard it, not sell it out cheaply and quickly. If kept beautiful, it is one of the few things, in fact, that can be sold year after year and still be there to leave as a natural heritage for our children. (See also W77-05402) (Sinha-OEIS)
W77-05406

UTILIZATION OF SOILS INFORMATION IN COASTAL AREA MANAGEMENT,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2L.
W77-05407

DREDGING AND BIRDS IN THE NORTH CAROLINA ESTUARY,
North Carolina Univ. at Wilmington. Dept. of Biology.
J. F. Parnell, and R. F. Soots.
In: Coastal Development and Areas of Environmental Concern, Proceedings of Symposium held Greenville, NC on March 5, 1975. North Carolina University Sea Grant Report No. UNC-SG-75-18, p 48-53, September 1975. 1 fig.

Descriptors: *North Carolina, *Estuaries, *Dredging, *Waste disposal, *Beaches, *Resources development, Birds, Coasts, Public rights.
Identifiers: *Public interest, *Coastal zone management, Resources management, Environmental concern, Intracoastal waterways.

Dredging involves the removal of materials from the bottom of waterways and its subsequent deposition elsewhere, usually adjacent to the channel being constructed or maintained. Such deposits of dredged material may be in water, marsh, or on high land. When in water or on marsh, new islands have often resulted. The construction of new sandy islands in the estuaries has paralleled in time the development and increased human use of the ocean beaches--beaches that were the natural nesting habitat of most of North Carolina's gulls, terns, and shorebirds. A basic step is to provide many of these dredge islands the protection of inclusion as areas of environmental concern. A state agency must assume the responsibility for protection and limited management. At present dredge spoil deposition occurs all summer with no official regard for the nesting birds. Guidance is also necessary in the face of changing dredging policy and increased human activity in the estuaries. (See also W77-05402) (Sinha-OEIS)
W77-05408

SALT MARSHES,
North Carolina Univ. at Chapel Hill. Marine Sciences Program.
For primary bibliographic entry see Field 2L.
W77-05409

THE ESTUARY - AN AREA OF ENVIRONMENTAL CONCERN,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Coastal Fisheries Research Center.
For primary bibliographic entry see Field 2L.
W77-05410

ARCHAEOLOGICAL SITES AS INTERIM AREAS OF ENVIRONMENTAL CONCERN,
East Carolina Univ., Greenville. Dept. of Sociology and Anthropology.
D. S. Phelps.
In: Coastal Development and Areas of Environmental Concern, Proceedings of Symposium held

Greenville, NC on March 5, 1975. North Carolina University Sea Grant Report No. UNC-SG-75-18, p 73-79, September 1975.

Descriptors: *North Carolina, *Archaeology, *Conservation, *Coasts, *History, *Resources development, Estuaries, Salt marshes, Public rights.
Identifiers: *Resources management, *Environmental concern, *Coastal zone management, Public interest.

Archaeological and historical sites are, in a very real sense, the most important areas of environmental concern in the naturally complex and relatively fragile coastal zone of North Carolina. Site loss by natural forces and human agencies is accelerating in the coastal area; the last remaining Indian site in Hatteras Village is staked for cottage lots, one at Wanchese is eroding from the rise in sea level, the Chowanoke capital on the Chowan has been built upon, and another site has been plowed into oblivion. It is normal for human culture to change the environment, but if we are to save any vestige of our heritage it must be now. The long-term gains in knowledge and economics will far outweigh what may be considered short-term losses. (See also W77-05402) (Sinha-OEIS)
W77-05411

HISTORIC SITES,
North Carolina Dept. of Cultural Resources, Raleigh.
J. K. Seapker.
In: 'Coastal Development and Areas of Environmental Concern', Proceedings of Symposium held Greenville, NC on March 5, 1975. North Carolina University Sea Grant Report No. UNC-SG-75-18, p 80-83, September 1975.

Descriptors: *North Carolina, *History, *Coasts, *Resource development, Land use, Public rights.
Identifiers: *Resources management, *Environmental concern, *Coastal zone management, Public interest.

Historic sites are among the categories of fragile properties which the Coastal Resources Commission could designate as interim areas of environmental concern. In defining the categories of historic sites, three already established programs were used: The National Register of Historic Places; National Historic Landmarks; and the state historic site and grant-in-aid programs. (See also W77-05402) (Sinha-OEIS)
W77-05412

IMPLEMENTATION OF THE COASTAL AREA MANAGEMENT ACT,
North Carolina Univ. at Chapel Hill. Urban Services Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6E.
W77-05413

FINAL ENVIRONMENTAL STATEMENT. VOL I, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
Bureau of Land Management Pacific OCS Office, Final Environmental Statement, Vol I, Proposed 1975 Outer Continental Shelf Oil and Gas General Lease Sale, Offshore Southern California, 1975. 909 p.

Descriptors: *Continental Shelf, *California, *Environmental effects, *Baseline studies, *Water quality control, *Resources development, *Water resources, *Water pollution sources, Aquatic life, Leases, Natural resources, Oil pollution, Gases.
Identifiers: *Outer Continental Shelf, Environmental impact, Channel Islands.

In this first of a set of five volumes a description of the proposed lease region is followed by a description of the environment in this part of the offshore area of Southern California. The proposed federal action under consideration is the leasing of 297 tracts in offshore Southern California. These tracts encompass an area of 1.55 million acres and are located beyond the three mile limit. The BLM-Pacific OCS Office has the responsibility of assessing the overall environmental impacts which may occur from the proposed leasing operations. Preliminary resource reports on the environment were prepared for the overall sale area by utilizing a combination of an in-house study and review of a study contracted with the Southern California Ocean Studies Consortium (a team of five California State universities). Both studies included an examination of the physical, biological, economic, and social resources within Southern California and its offshore borderland. An environmental report was then prepared and submitted to the BLM manager prior to actual tract selection recommendation. The report was prepared by the Environmental Assessment Team for the purpose of ensuring that all potential tracts had been fully reviewed for potential environmental hazards. (Sinha-OEIS)
W77-05536

FINAL ENVIRONMENTAL STATEMENT. VOL 2, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
Bureau of Land Management Pacific OCS Office, Final Environmental Statement, Vol 2, Proposed 1975 Outer Continental Shelf Oil and Gas General Lease Sale, Offshore Southern California, 1975. 767 o.

Descriptors: *Continental Shelf, *California, *Water pollution sources, *Environmental effects, *Oil spills, *Oil pollution, *Water quality, *Resources development, *Ecosystems, *Baseline studies, *Accidents, *Biological communities, Leases, *Estuaries, Bays, Marshes, Intertidal areas, Wetlands, Oil industry, Drilling fluids, Navigation.
Identifiers: *Outer Continental Shelf, *Environmental impact, Commercial fisheries, Channel Islands, Sport fisheries, Air quality.

Volume 2 of this series describes the general environmental impacts of offshore oil and gas operations. The development and production activity following this potential sale could result in a variety of impacts on the natural environment, Channel Island area resources, air and water quality, land use patterns, the social order and the economy. The intent of this section is to illustrate how routine operation and occasional accidents can result in situations leading to human and natural environmental impacts. Included are statistics, and where possible, examples and case histories of impacts caused by incidents and by day-to-day operations considered 'unavoidable' in light of existing regulations, technology and operating practices. Although oil spills resulting from this proposed sale can in general be avoided, some of the effects of an oil spill, if one should occur, are considered unavoidable and are also discussed. Finally alternatives to the proposed action are presented. (Sinha-OEIS)
W77-05537

FINAL ENVIRONMENTAL STATEMENT. VOL 3, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
Bureau of Land Management Pacific OCS Office, Final Environmental Statement, Vol 3, Proposed 1975 Outer Continental Shelf Oil and Gas General Lease Sale, Offshore Southern California, 1975. 857 p.

Descriptors: *Continental shelf, *California, *Environmental effects, *Baseline studies, *Water quality control, *Resources development, *Water resources, *Water pollution sources, Aquatic life, Leases, Natural resources, Oil pollution, Accidents, Estuaries, Bays, Marshes, Intertidal areas, Wetlands, Legal aspects.
Identifiers: *Outer Continental Shelf, *Environmental impact, Public hearings.

The third volume of a set of five contains the documentation dealing with the consultation and coordination with various agencies in the preparation of the draft environmental statement. It also contains the records of various public hearings and the review of the draft environmental statement leading to the preparation of the final environmental statement. (Sinha-OEIS)
W77-05538

FINAL ENVIRONMENTAL STATEMENT. VOL 4, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
Bureau of Land Management Pacific OCS Office, Final Environmental Statement, Vol 4, Proposed 1975 Outer Continental Shelf Oil and Gas General Lease Sale, Offshore Southern California, 1975. 886 p.

Descriptors: *Continental shelf, *California, *Environmental effects, *Baseline studies, *Water quality control, *Resources development, *Water resources, *Water pollution sources, Aquatic life, Leases, Natural resources, Oil pollution, Accidents, Estuaries, Bays, Marshes, Intertidal areas, Wetlands, Legal aspects, Regulation.
Identifiers: *Outer Continental Shelf, *Environmental impact, Commercial fisheries, Sport fisheries, Air quality, Channel Islands.

This volume comprises twenty-seven appendices of details including summary descriptions of environmental conditions and pollution effects of direct and indirect activities involved in the development of oil and gas resources of the offshore area of Southern California. It also includes a history and description of oil and gas operations, summary of regulations concerning hazards to navigation and a list of significant felt earthquakes in the region. (Sinha-OEIS)
W77-05539

FINAL ENVIRONMENTAL STATEMENT. VOL 5, PROPOSED 1975 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE OFFSHORE SOUTHERN CALIFORNIA (O.C.S. SALE NO. 35).
Bureau of Land Management, Los Angeles, Calif. Pacific Outer Continental Shelf Office.
Bureau of Land Management Pacific OCS Office, Final Environmental Statement, Vol 5, Proposed 1975 Outer Continental Shelf Oil and Gas General Lease Sale, Offshore Southern California, 1975.

Descriptors: *Continental Shelf, *California, *Environmental effects, *Baseline studies, *Water quality control, *Resources development, *Water resources, *Water pollution sources, Aquatic life, Leases, Natural resources, Oil pollution, Accidents, Estuaries, Bays, Marshes, Intertidal areas, Wetlands, Geology, Aesthetics.
Identifiers: *Outer Continental Shelf, *Environmental impact, Commercial fisheries, Sport fisheries, Air quality, Channel Islands, Tectonics, Bottom sediments.

This volume contains the graphics, maps and charts illustrating the lease sale area offshore

Southern California. Specifically these are: current lease sale; potential use conflicts; rare and endangered species; land use; air basins, winds and vegetation; aesthetics; commercial fisheries; sport fishing; marine mammals; shoreline types; geology; tectonics; bottom sediments; geologic cross sections; and impact potential. (Sinha-OEIS)
W77-05540

THERMAL ECOLOGY II.
For primary bibliographic entry see Field 5C.
W77-05541

THE POWER PARK CONCEPT: AMELIORATING MAN'S DISORDER WITH NATURE'S ORDER,
Georgia Univ., Athens, Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W77-05542

THE CONNECTICUT RIVER ECOLOGICAL STUDY: A SYNOPSIS,
Yale Univ., New Haven, Conn. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-05589

7. RESOURCES DATA

7A. Network Design

LINK LENGTH ORGANIZATION AND NETWORK SCALE DEPENDENCIES IN THE NETWORK DIAMETER MODEL,
State Univ. of New York at Buffalo. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W77-05161

A VARIABLE SOURCE AREA MODEL OF THE RAINFALL-RUNOFF PROCESS BASED ON THE WATERSHED STREAM NETWORK,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-05178

A POINT STOCHASTIC MODEL FOR CONTINENTAL DROUGHTS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2B.
W77-05183

NETWORK DESIGN FOR THE ESTIMATION OF AREAL MEAN OF RAINFALL EVENTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W77-05194

RAINFALL NETWORK DESIGN FOR RUNOFF PREDICTION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W77-05341

STANDARDS FOR INTERCHANGE OF WATER RESOURCES DATA ON COMPUTER MEDIA,
Australian Water Resources Council, Camberra.
For primary bibliographic entry see Field 7C.
W77-05523

7B. Data Acquisition

DETERMINATION OF SNOW DEPTH AND WATER EQUIVALENT BY REMOTE SENSING,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
For primary bibliographic entry see Field 2C.
W77-05104

EVALUATION OF THE OPTIMAL THICKNESS OF SOIL BETWEEN SOURCE AND DETECTOR IN THE GAMMA-RAY TRANSMISSION METHOD,
Roorkee Univ. (India). Dept. of Physics.
For primary bibliographic entry see Field 2G.
W77-05151

USING LINEAR PROGRAMMING TO DESIGN OIL POLLUTION DETECTION SCHEDULES,
Naval Underwater Systems Center, Newport, R. I.
For primary bibliographic entry see Field 5G.
W77-05250

GUIDELINES FOR COLLECTION AND FIELD ANALYSIS OF GROUND-WATER SAMPLES FOR SELECTED UNSTABLE CONSTITUENTS,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-05262

INLAND LAKES WATER QUALITY AND WATERSHED PLANNING: REMOTE SENSING TECHNOLOGY APPLICATIONS,
Michigan Environmental Research Inst., Ann Arbor.
For primary bibliographic entry see Field 6B.
W77-05297

CLIMATOLOGICAL AND PHOTOGRAMMETRIC SPECULATIONS ON MASS-BALANCE CHANGES OF MCCALL GLACIER, BROOKS RANGE, ALASKA,
New Brunswick Univ., Fredericton. Dept. of Surveying Engineering.
For primary bibliographic entry see Field 2C.
W77-05426

SEISMIC SIGNALS ASSOCIATED WITH AVALANCHES,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2C.
W77-05429

RADIO-ECHO POWER PROFILING,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 2C.
W77-05430

ERROR PROPAGATION IN DETERMINING HYDRAULIC CONDUCTIVITIES FROM SUCCESSIVE WATER CONTENT AND PRESSURE HEAD PROFILES,
California Univ., Riverside.
For primary bibliographic entry see Field 2G.
W77-05434

TOWARDS A ROUTINE TEST FOR THE ASSESSMENT OF THE CRITICAL TRACTIVE FORCES OF COHESIVE SOILS,
Western Australia Univ., Nedlands. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-05440

INSTRUMENTS FOR STUDYING OCEAN POLLUTION,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W77-05448

DISSOLVED NITROGEN AS A TRACER OF FISH MOVEMENTS,
British Columbia Univ., Vancouver.
For primary bibliographic entry see Field 5B.
W77-05461

MEASUREMENT OF AND CALIBRATION FOR GAMMA SPECTROSCOPY OF MISSISSIPPI RIVER WATER,
Louisiana State Univ., Baton Rouge. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5A.
W77-05486

THE USE OF REMOTE SENSING IN A STUDY OF SUBMERGED AQUATIC MACROPHYTES OF THE PAMLICO RIVER ESTUARY, N.C.,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W77-05487

DETERMINING SOIL WATER DIFFUSIVITIES FROM ONE-STEP OUTFLOW EXPERIMENTS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 2G.
W77-05531

7C. Evaluation, Processing and Publication

IMPROVING INFORMATION DISSEMINATION AND TECHNOLOGY TRANSFER IN THE WATER RESOURCES FIELD,
Missouri Water Resource Center, Columbia.
For primary bibliographic entry see Field 6B.
W77-05102

OPTIMAL USE OF WATER AND RELATED RESOURCES FOR DIVERSIFIED FARMING ON OAHU, HAWAII: A HYPOTHETICAL STUDY,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 3F.
W77-05105

ESTIMATION OF AREAL AVERAGE PRECIPITATION USING DIFFERENT NETWORK DENSITIES AND AVERAGING TECHNIQUES,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 2B.
W77-05109

HYDROGRAPH ANALYSIS: A COMPUTERIZED SEPARATION TECHNIQUE,
Intermountain Forest and Range Experiment Station, Moscow, Idaho.
For primary bibliographic entry see Field 4A.
W77-05117

A DATA INTEGRATION STUDY OF LAKE ONRARIA FOR THE EPISODE JULY 19 - AUGUST 2, 1972, PART I,
Northwestern Univ., Evanston, Ill. Technological Inst.
For primary bibliographic entry see Field 2H.
W77-05125

A DATA INTEGRATION STUDY OF LAKE ONTARIO FOR THE EPISODE JULY 19 - AUGUST 2, 1972. PART II,
Northwestern Univ., Evanston, Ill. Technological Inst.
For primary bibliographic entry see Field 2H.
W77-05126

DETERMINATION OF STORM VELOCITIES AS AN AID TO THE QUALITY CONTROL OF RECORDING RAINGAUGE DATA,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W77-05146

AN APPLICATION OF COMPUTER GRAPHICS TO ANALYSIS OF EXTREMES,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 2E.
W77-05164

MODEL FOR LAYOUT AND DESIGN OF SEWER SYSTEMS,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-05195

A WATER QUALITY DATA REPORT OF THE COORDINATED MONITORING PROGRAM. METHODS AND DATA FOR 1974.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 2L.
W77-05208

A COMPUTER-AIDED SNOWMELT MODEL FOR AUGMENTING WINTER STREAMFLOW SIMULATION IN A SOUTHERN ONTARIO DRAINAGE BASIN,
Ontario Ministry of the Environment, Toronto (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W77-05247

SOME PROBLEMS IN THE SIMULATION OF VERY LARGE HYDRODYNAMIC SYSTEMS,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W77-05258

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE,
Geological Survey, Menlo Park, Calif.
Water-Data Report CA-75-4, November 1976. 401 p, 12 fig, 5 tab, 34 ref.

Descriptors: *California, *Hydrologic data, *Surface waters, *Water quality, *Groundwater, Flow rates, Gaging stations, Lakes, Reservoirs, Chemical analysis, Sediments, Water temperature, Sampling, Sites, Water levels, Water analysis.

Volume 4 of water resources data for the 1975 water year for California consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report, on Northern Central Valley basins and the Great Basin from Honey Lake basin to Oregon State line, contains discharge records for 199 gaging stations; stage-only records for 1 gaging station; stage and contents for 30 lakes and reservoirs; water quality for 84 stations, and water levels for 3 observation wells. Also included are 24 crest-stage partial-record stations and 4 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W77-05263

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 3. SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER,
Geological Survey, Menlo Park. Water Resources Div.
Water-Data Report CA-75-3, December 1976. 397 p, 12 fig, 5 tab, 34 ref.

Descriptors: *California, *Hydrologic data, *Surface waters, *Water quality, *Groundwater, Flow rates, Gaging stations, Lakes, Reservoirs, Chemical analysis, Sediments, Water temperature, Sampling, Sites, Observation wells, Water levels, Water analysis.
Identifiers: *South Central Valley basins, *The Great Basin.

Volume 3 of water resources data for the 1975 water year for California consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality in lakes and reservoirs; and water levels in wells in Southern Central Valley basins and the Great Basin from Walker River to Truckee River. Included are discharge records for 188 gaging stations; stage-only records for 1 gaging station; stage and contents for 38 lakes and reservoirs; water quality for 62 stations, and water levels for 15 observation wells. Also included are 31 crest-state partial-record stations and 13 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W77-05264

GROUND-WATER DATA FOR LEFLORE COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
G. J. Dalsin.
Mississippi Board of Water Commissioners, Jackson, County Report No 5, 1976. 35 p, 3 fig, 3 tab, 9 ref.

Descriptors: *Groundwater resources, *Well data, *Aquifers, *Water quality, *Mississippi, Hydrologic data, Water wells, Pumping, Water yield, Water utilization, Water levels, Chemical analysis.
Identifiers: Leflore County(Miss), Sand intervals.

This is one in a series of ground-water basic-data reports being prepared for the 82 counties of Mississippi. The report is intended to partly meet the need for information about the availability and quality of water in Mississippi. Data for Leflore County are presented in three tables: (1) well descriptions, (2) chemical analyses, and (3) sand intervals from electric logs. Three maps show the locations of the wells. (Wodard-USGS)
W77-05265

GROUND-WATER DATA FOR HUMPHREYS COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
B. E. Wasson.
Mississippi Board of Water Commissioners, Jackson, County Report No 6, 1976. 21 p, 3 fig, 3 tab, 9 ref.

Descriptors: *Groundwater resources, *Well data, *Aquifers, *Water quality, *Mississippi, Hydrologic data, Water wells, Pumping, Water yield, Water utilization, Water levels, Chemical analysis.
Identifiers: Humphreys County(Miss), Sand intervals.

This is one in a series of ground-water basic-data reports being prepared for the 82 counties of Mississippi. The report is intended to partly meet the need for information about the availability and quality of water in Mississippi. Data for Humphreys County are presented in three tables: (1) well descsriptions, (2) chemical analyses, and (3) sand intervals from electric logs. Three maps show the locations of the wells. (Woodard-USGS)
W77-05266

GROUND-WATER DATA FOR ISSAQUENA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
B. E. Wasson.
Mississippi Board of Water Commissioners, Jackson, County Report No 7, 1976. 18 p, 3 fig, 3 tab, 9 ref.

Descriptors: *Groundwater resources, *Well data, *Aquifers, *Water quality, *Mississippi, Hydrologic data, Water wells, Pumping, Water yield, Water utilization, Water levels, Chemical analysis.
Identifiers: Issaquena County(Miss), Sand intervals.

This is one in a series of ground-water basic-data reports being prepared for the 82 counties of Mississippi. The report is intended to meet, in part, the need for information about the availability and quality of water in Mississippi. Data for Issaquena County are presented in three tables: (1) well descriptions, (2) chemical analyses, and (3) sand intervals from electric logs. Three maps show the locations of the wells. (Woodard-USGS)
W77-05267

GROUND-WATER DATA FOR QUITMAN COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
G. J. Dalsin.
Mississippi Board of Water Commissioners, Jackson, County Report No 8, 1976. 20 p, 3 fig, 3 tab, 10 ref.

Descriptors: *Groundwater resources, *Well data, *Aquifers, *Water quality, *Mississippi, Hydrologic data, Water wells, Pumping, Water yield, Water utilization, Water levels, Chemical analysis.
Identifiers: Quitman County(Miss), Sand intervals.

This is one in a series of ground-water basic-data reports being prepared for the 82 counties of Mississippi. The report is intended to meet, in part, the need for information about the availability and quality of water in Mississippi. Data for Quitman County are presented in three tables: (1) well descriptions, (2) chemical analyses, and (3) sand intervals from electric logs. Three maps show the locations of the wells. (Woodard-USGS)
W77-05268

GROUND-WATER DATA FOR COAHOMA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
G. J. Dalsin.
Mississippi Board of Water Commissioners, Jackson, County Report No 9, 1976. 22 p, 3 fig, 3 tab, 10 ref.

Descriptors: *Groundwater resources, *Well data, *Aquifers, *Water quality, *Mississippi, Hydrologic data, Water wells, Pumping, Water yield, Water utilization, Water levels, Chemical analysis.
Identifiers: Coahoma County(Miss), Sand intervals.

This is one in a series of ground-water basic-data reports being prepared for the 82 counties of Mississippi. The report is intended to meet, in part, the need for information about the availability and quality of water in Mississippi. Data for Coahoma County are presented in three tables: (1) well descriptions, (2) chemical analyses, and (3) sand intervals from electric logs. Three maps show the locations of the wells. (Woodard-USGS)
W77-05269

GROUND-WATER DATA FOR TATE COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
G. J. Dalsin.
Mississippi Board of Water Commissioners, Jackson, County Report No 10, 1976. 29 p, 3 fig, 3 tab, 7 ref.

Descriptors: *Groundwater resources, *Well data, *Aquifers, *Water quality, *Mississippi, Hydrologic data, Water wells, Pumping, Water yield, Water utilization, Water levels, Chemical analysis.
Identifiers: Tate County(Miss), Sand intervals.

This is one in a series of ground-water basic-data reports being prepared for the 82 counties of Mississippi. The report is intended to meet, in part, the need for information about the availability and quality of water in Mississippi. Data for Tate County are presented in three tables: (1) well descriptions, (2) chemical analyses, and (3) sand intervals from electric logs. Three maps show the locations of the wells. (Woodard-USGS)
W77-05270

GROUND-WATER DATA FOR TUNICA COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
G. J. Dalsin.
Mississippi Board of Water Commissioners, Jackson, County Report No 11, 1976. 15 p, 3 fig, 3 tab, 10 ref.

Descriptors: *Groundwater resources, *Well data, *Aquifers, *Water quality, *Mississippi, Hydrologic data, Water wells, Pumping, Water yield, Water utilization, Water levels, Chemical analysis.
Identifiers: Tunica County(Miss), Sand intervals.

This is one in a series of ground-water basic-data reports being prepared for the 82 counties of Mississippi. The report is intended to meet, in part, the need for information about the availability and quality of water in Mississippi. Data for Tunica County are presented in three tables: (1) well descriptions, (2) chemical analyses, and (3) sand intervals from electric logs. Three maps show the locations of the wells. (Woodard-USGS)
W77-05271

GROUND-WATER LEVELS IN OBSERVATION WELLS IN OKLAHOMA, 1971-74,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
R. L. Goemaat.
Open-file report 76-664, October 1976. 142 p, 1 fig, 1 tab.

Descriptors: *Water levels, *Groundwater, *Observation, Well data, *Oklahoma, Basic data collections.
Well descriptions and water-level measurements are presented for 146 observation wells in 38 counties in Oklahoma for calendar years 1971-74. The objectives of the observation-well program are (1) to provide long-term records of water-level fluctuations in representative wells, (2) to facilitate the prediction of water-level trends and indicate the future availability of ground-water supplis, and (3) to provide in information for use in basic research. (Woodard-USGS)
W77-05275

HYDROLOGY AND WATER RESOURCES OF THE CHARLES RIVER BASIN, MASSACHUSETTS,
Geological Survey, Boston, Mass. Water Resources Div.
E. H. Walker, S. W. Wandle, Jr., and W. W. Caswell.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202, price $3.75. Hydrologic Investigations Atlas HA-554, 1975. 3 sheets, 4 tab, 23 ref.

Descriptors: *Watershed management, *Water resources development, *Available water, *Water quality, *Massachusetts, Hydrologic data, *Maps, Surface waters, Groundwater, Aquifer characteristics, Streamflow, Flow rates, Water yield, Hydrology, Hydrogeology, Urbanization, Water demand.
Identifiers: *Charles River basin(Mass).

The Charles River basin encompasses about 300 square miles of gently rolling to hilly terrain, with altitudes ranging from 586 feet in Hopkinton to below 10 feet in Boston, Mass. The area is essentially urban, although the towns in the upper basin still retain some rural character. The population of the middle and upper parts increased 80 percent between 1950 and 1970, while the population in the lower part declined 4 percent. This atlas summarizes the water resources and associated water problems of the area. The investigation upon which the atlas is based was made from 1968 to 1971 and is part of a series covering the major river basins in Massachusetts. The study area includes 251 sq mi of drainage area above the gaging station at Waltham. (Woodard-USGS)
W77-05280

HYDROLOGIC UNIT MAP--1974, STATE OF NEBRASKA.
Geological Survey, Reston, Va.
Available from U.S. Geological Survey, Box 25286, Denver, CO 80225, price $1.25. Hydrologic Unit Map of Nebraska, 1976. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *Nebraska, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Nebr), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Nebraska that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-05281

HYDROLOGIC UNIT MAP--1974, STATE OF NEW MEXICO.
Geological Survey, Reston, Va.
Available from U.S. Geological Survey, Box 25286, Denver, Colo. 80225, price $1.25. Hydrologic Unit Map of New Mexico, 1976. 1 sheet, 1 map.

Descriptors: *Maps, *Hydrology, *New Mexico, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(N Mex), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in New Mexico that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-05282

LAKE OF OREGON: VOLUME 4. CLACKAMAS COUNTY,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 2H.
W77-05283

WAPSIPINICON RIVER AND MALONE CREEK FLOOD PLAIN INFORMATION, INDEPENDENCE, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-05284

MISSISSIPPI RIVER FLOOD PLAIN INFORMATION, MILE 506.9 TO MILE 549.4.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-05287

KISHWAUKEE RIVER FLOOD PLAIN INFORMATION, WINNEBAGO COUNTY, ILLINOIS.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-05288

FLOOD PLAIN INFORMATION REPORT, SKUNK RIVER AND SQUAW CREEK, STORY COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-05289

FLOOD PLAIN INFORMATION REPORT, DUCK CREEK, SCOTT COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-05290

FLOOD PLAIN INFORMATION: SAND AND SLATE CREEKS, NEWTON, KANSAS.
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W77-05300

FLOOD PLAIN INFORMATION: LOTTS CREEK AND MILL CREEK, CITY OF STATESBORO, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W77-05301

FLOOD PLAIN INFORMATION: NORTH PLATTE RIVER, SCOTTSBLUFF, NEBRASKA.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-05302

FLOOD PLAIN INFORMATION: AGUA FRIA RIVER, MARICOPA COUNTY, ARIZONA,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W77-05303

LANGUAGE FOR MODELING HYDROBIOLOGICAL PROCESSES, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
For primary bibliographic entry see Field 5B.
W77-05329

VARIATION OF LINK MAGNITUDE WITH MAP SCALE,
South Carolina Univ., Columbia. Dept. of Geology.
I. Kheoruenromne, W. E. Sharp, and L. R. Gardner.
Water Resources Research, Vol. 12, No. 5, p 919-923, October 1976. 3 fig, 3 tab, 12 ref.

Descriptors: *Geomorphology, *Maps, *Drainage patterns(Geologic), Streams, Watersheds(Basins), Geology, Statistics, Networks, Mathematical studies.
Identifiers: *Stream networks, Map scales, Link magnitude, Stream order.

The mean ratio of the link magnitude of drainage patterns on a small-scale map to that of a large-scale map is equal to twice the ratio of the map scales. This findings was confirmed by statistical testing of link magnitude data from a large number of maps of serveral different scales. The distribution of the observed link magnitude ratios is log normal, and the variance is independent of map scale ratio. These results can be partially explained by Shreve's theory of topologically random stream networks. (Lee-ISWS)
W77-05338

CRITICAL DURATION OF RAINFALL FOR FLOOD ESTIMATION,
Darling Downs Inst. of Advanced Education, Toowoomba (Australia).
For primary bibliographic entry see Field 2B.
W77-05342

THE ASYMPTOTIC DISTRIBUTION OF THE RANGE AND OTHER FUNCTIONS OF PARTIAL SUMS OF STATIONARY PROCESSES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4A.
W77-05347

PEAK DISCHARGE FREQUENCY FROM RAINFALL INFORMATION,
Colorado Univ. Denver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W77-05359

FLOOD ANALYSIS BY SMEMAX TRANSFORMATION,
For primary bibliographic entry see Field 2E.
W77-05360

COMPUTER PREDICTION OF NEARSHORE AND SURF ZONE STATISTICS,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 2L.
W77-05385

DEUTERIUM, TRITIUM AND GROSS-BETA-ACTIVITY INVESTIGATIONS ON ALPINE GLACIERS (OTZTAL ALPS),
Innsbruck Univ. (Austria). Physikalisches Institut.
For primary bibliographic entry see Field 2C.
W77-05420

COMPUTING DERIVATIVES FROM EQUALLY SPACED DATA,
Bell Telephone Labs., Inc., Holmdel, N. J.
For primary bibliographic entry see Field 2B.
W77-05437

THE MEASUREMENT OF 1 MIN RAIN RATES FROM WEIGHING RAINGAGE RECORDINGS,
Bell Telephone Labs., Inc., Holmdel, N.J.
For primary bibliographic entry see Field 2B.
W77-05438

WAVE ENTRAINMENT OF SEDIMENT FROM RIPPLED BEDS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2J.
W77-05445

STANDARDS FOR INTERCHANGE OF WATER RESOURCES DATA ON COMPUTER MEDIA,
Australian Water Resources Council, Camberra.
Australian Water Resources Council Hydrological Series No. 10, Australian Government Publishing Service, Canberra, 1976. 69 p., 4 append.

Descriptors: *Hydrologic data, *Data collections, *Computer programs, *Standards, *Australia, Data transmission, Surface waters, Meteorological data, Groundwater, Water quality.

The collection of national hydrologic data in Australia is complicated by the number of independent authorites responsible for initial collection and storage of the data. A set of standard sepecifications is presented for the exchange of data on computer media, designed to allow direct interchange between authorities employing different computers and internal storage formats. Included are the formats, media and codes to be used, together with recommended units, in three major fields of data collection: surface waters and meteorology; groundwater; and water quality. (CSIRO)
W77-05523

8. ENGINEERING WORKS

8A. Structures

CIVIL ENGINEERING CONSIDERATIONS,
Harris (Frederick R.), Inc., Great Neck, N. Y.
J. J. Bonasia.
In: 'Evaluation of Multi-Purpose Offshore Industrial-Port Islands: General Island Characteristics', Delaware Univ. Final Tech. Rept. to NSF-RANN, No. NSF-RE-E-054A, p 208-293, May 1975. 27 fig, 9 tab, 22 ref.

Descriptors: *Resources development, *Environmental effects, Water resources, Engineering, Civil engineering, Harbors, Islands, Industries, Facilities, Continental Shelf.
Identifiers: *Outer Continental Shelf, *Artificial islands, *Artificial ports, Ports, Energy resources.

The objective of this study was to research existing civil engineering technology to determine whether multi-purpose offshore industrial port-islands are suitable for construction on the Atlantic and Gulf continental shelf of the United States. Frederick R. Harris, Inc. was assigned the task of evaluating design and construction techniques for manmade filled islands, identifying candidate sites and of developing a conceptual island layout to support industries selected by members of the project team. The scope of work also included determining the requirements for island harbor facilities, ship access, shore-to-island access, island support facilities, sources of borrow material and construction methods, costs, and scheduling. A manmade filled multi-purpose industrial/port island is feasible to construct on the Atlantic and Gulf continental shelf in water depths up to approximately 60 feet. Two conceptual layouts were developed to support the industrial complex. One alternative layout provides support facilities to the industries including residential and recreational areas. The other layout provides for limited residential area. Harbors facilities includes a deep-water channel. (See also W77-05377) (Sinha-OEIS).
W77-05380

8B. Hydraulics

OPTIMAL DESIGN OF MULTILEVEL BRANCHING SEWER SYSTEMS,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-05192

MODEL FOR LAYOUT AND DESIGN OF SEWER SYSTEMS,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-05195

CONTROL OF SALT-WATER INTRUSION BY RECHARGE WELLS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W77-05207

DECOMPOSITION OF WATER DISTRIBUTION NETWORKS,
Illinois Inst. of Tech., Chicago.
For primary bibliographic entry see Field 4A.
W77-05251

RESPONSE OF GROUND-WATER LEVELS TO FLOOD CONTROL OPERATIONS IN THREE BASINS, SOUTHEASTERN FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-05278

DISPERSION OF WATER POLLUTANTS IN A TURBULENT SHEAR FLOW,
Stone and Webster Engineering Corp., Boston, Mass.
For primary bibliographic entry see Field 5B.
W77-05346

CHARACTERISTICS OF PROPORTIONAL WEIRS,
Tamil Nadu Agricultural Univ., Coimbatore (India). Dept. of Soil and Water Conservation Engineering.
D. Chandrasekaran, and N. S. L. Rao.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY11, Proceedings Paper 12560, p 1677-1692, November 1976. 8 fig, 2 tab, 18 ref, 3 append.

Descriptors: *Weirs, *Discharge measurement, *Discharge coefficient, Hydraulics, Discharge(Water), Mathematical studies, Equations, Mathematical models, Laboratory tests.
Identifiers: *Proportional weirs, *Geometric surfaces.

The design details of a linear proportional weir fitted with circular bottom and the proof of the geometrical continuity theorem used for the design were presented in this paper. The discharge passing through the weir is a linear function of the head. The verification of the assumed linear discharge-head relation was furnished for one of the three weirs with which experiments were conducted. The coefficient of discharge for this typical weir was found to be constant with a value of 0.59. (Bhowmik-ISWS)
W77-05355

APPLICATION OF FLOW-SEDIMENT MODEL TO RED RIVER,
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 2J.
W77-05357

SECOND APPROXIMATION TO GRAVITY WAVE ATTENUATION,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
M. de St. Q. Isaacson.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW1, Proceedings Paper 12731, p 43-55, February 1977. 4 fig, 18 ref, 2 append.

Descriptors: *Attenuation, *Waves(Water), *Boundary layers, Coastal engineering, Energy dissipation, Hydrodynamics, Wavelength, Hydraulics, Equations, Mathematical studies.
Identifiers: *Wave height, Wave propagation, Viscous damping, Attenuation coefficients, Sinusoidal wave theory, Wave number, Sinusoidal wave approximation.

A second approximation was developed for the viscous damping of cnoidal waves propagating over a smooth horizontal bed. Experimental data are needed to examine the ranges of validity of the theory, although it may possibly apply at greater depths than does the first approximation and over a wider range of heights than does the theory of sinusoidal wave damping. Calculated attenuation coefficients vary markedly with wave height itself, and for shallow water the coefficients are considerably larger than those predicted by sinusoidal wave theory. For intermediate depths the calculated attentuation coefficients are slightly smaller. The variation of wave number with distance, not predicted by the first approximation, was also determined. The damping of second order Stokes waves was shown to be given by the sinusoidal wave approximation. (Lee-ISWS)
W77-05366

HYDRODYNAMIC DAMPING AND 'ADDED MASS' FOR FLEXIBLE OFFSHORE PLATFORMS,
California Univ., Berkeley.
For primary bibliographic entry see Field 5G.
W77-05375

WAVE ENERGY TRANSFORMATION OVER IRREGULAR BOTTOM,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W77-05444

WAVE ENTRAINMENT OF SEDIMENT FROM RIPPLED BEDS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2J.
W77-05445

TWO-DIMENSIONAL AIR-BUBBLE PLUME,
Royal Norwegian Air Force Academy, Trondheim.
I. Brevik.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW1, Proceedings Paper 12755, p 101-115, February 1977. 7 fig, 14 ref, 2 append.

Descriptors: *Bubbles, *Breakwaters, *Harbors, *Model studies, Mathematical models, Equations, Turbulence, Flow, Energy, Barriers, Momentum transfer, Hydrodynamics.
Identifiers: *Air-bubble plumes, Plumes, Kinetic energy.

Bubbles rising from a row of orifices along a pipe produce a water current which can be regarded as two-dimensional. This device is of great practical interest, e.g., for the protection of limited areas against sea waves or spreading of soil. This paper dealt with the theory of the vertical current above the pipe, involving (1) the use of the balance equations for momentum and kinetic energy, and (2) the conservation equation for the emitted air. The purpose was to calculate the vertical center line velocity and the lateral spread. Information from large-scale experiments of Kobus and Bulson was used to estimate the parameters in the theory. (Sims-ISWS)
W77-05446

RESERVOIR BASIN MORPHOMETRY,
Victoria-New South Wales Rivers and Water Supply Commission (Australia).
For primary bibliographic entry see Field 4A.
W77-05447

NUMERICAL SIMULATION OF A TWO DIMENSIONAL FLOOD WAVE PROPAGATION DUE TO DAM FAILURE,
Thessaloniki Univ., Salonika (Greece).
Th. Xanthopoulos, and Ch. Koutitas.
Journal of Hydraulic Research, Vol. 14, No. 4, p 321-331, 1976. 21 fig, 12 ref.

Descriptors: *Flood waves, *Flood routing, *Dam failure, *Numerical analysis, Mathematical models, Roughness(Hydraulic), Foreign countries, Foreign research, Equations, Dry beds.
Identifiers: *Two-dimensional flood wave, *Greece.

The propagation of a flood wave on a two-dimensional dry plain was investigated by the aid of a numerically solved mathematical model. The velocity components, the water depth, and the position of the water front for each time step were computed through an explicit finite difference scheme in Eulerian space. The forcing function consisted of the charge by a discharge hydrograph on a boundary point. A series of numerical experiments gave qualitative proofs of the model's validity, which was finally tested for the case of unidirectional flow by comparison to laboratory experiments. The proposed model was applied on a Northern Greece plain for the study of its inundation due to the failure of an operating earth dam. (Bhowmik-ISWS)
W77-05450

8D. Soil Mechanics

A GUIDE FOR THE GEOLOGIC AND HYDROLOGIC EVALUATION OF SMALL LAKES SITES IN MISSOURI,
Geological Survey, Rolla, Mo. Water Resources Div.
T. J. Dean, J. H. Barks, and J. H. Williams.
Missouri Department of Natural Resources, Rolla, Geological Survey, Water Resources Report No 31, 1976. 50 p, 24 fig, 14 ref. 2 append.

Descriptors: *Lakes, *Impoundments, *Design criteria, *Missouri, Geology, Hydrologic properties, Evaluation, *Sites.
Identifiers: *Manmade lakes, Small lakes.

Few natural lakes exist in Missouri; however, suitable topography, abundant water and land available for development have resulted in numerous manmade lakes. The number of manmade lakes in Missouri with a surface area in excess of 5 acres is estimated to be nearly 2,500. Construction costs for each of these relatively small impoundments represent investments of approximately $5,000 to $250,000. The failure rate of lakes in Missouri is high because of adverse geologic and hydrologic conditions, faulty design and poor construction practices. The primary problem is water loss by subsurface leakage, but others include collapse of the lake bottom, dam failure, landslides, accelerated eutriphication and siltation. Improper location, excavation and placement of the core of the dam and removal of clayey soils from a potential lake bottom are poor construction practices that can lead to lake failure. The purpose is to aid landowners, contractors, engineers, government agencies and developers in the early recognition of geologic and hydrologic problems related to lake development. (Woodard-USGS)
W77-05260

SEEPAGE FROM SMALL EARTH DAMS,
Western Australia Dept. of Agriculture, South Perth.
R. G. Pepper.
Australian Journal of Soil Research, Vol. 15, No. 1, p. 39-50, March 1977. 1 fig, 3 tab, 42 ref., append.

Descriptors: *Earth dams, *Earth materials, *Laboratory tests, *Seepage, Leakage, Hydraulic conductivity, Dam design.

Methods for estimating the ability of a soil to hold water in a proposed dam are generally unreliable, or else too time-consuming and expensive in relation to the size and cost of a small earth dam. A study has been undertaken to examine laboratory tests which might be suitable for predicting dam performance. Tensiometers were installed in one farm dam to study seepage patterns. Seepage was limited by a thin layer with hydraulic conductivity one-tenth of that of deeper soil, bounding the excavated dam. Water balances of several earth tanks were used to estimate hydraulic conductivities of soils in situ. Most of the variation in hydraulic conductivity could be accounted for by sand content, exchangeable magnesium percentage, exchangeable sodium percentage, and dithionate extractable iron in the soils. Laboratory measurements of the hydraulic conductivities of disturbed samples had no relevance to the field situation. (CSIRO)
W77-05534

8F. Concrete

ASPHALTIC CONCRETE SLUDGE DRYING BEDS,
Toowoomba City Council (Australia).
For primary bibliographic entry see Field 5D.
W77-05525

8G. Materials

POLYURETHANE FOAM--A USEFUL NEW BOREHOLE GROUT,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 2G.
W77-05150

MILTON KEYNES SEWERAGE SYSTEM OPENED,
For primary bibliographic entry see Field 5D.
W77-05318

SEEPAGE FROM SMALL EARTH DAMS,
Western Australia Dept. of Agriculture, South Perth.
For primary bibliographic entry see Field 8D.
W77-05534

8I. Fisheries Engineering

EXPLORATORY STUDIES OF THE INTERACTIONS OF GAS SUPERSATURATION AND TEMPERATURE ON MORTALITY OF JUVENILE SALMONIDS,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5C.
W77-05416

A SUMMARY OF THE 1969 AND 1970 OUTMIGRATION OF JUVENILE CHINOOK SALMON AND STEELHEAD TROUT FROM THE SNAKE RIVER,
National Marine Fisheries Service, Seattle, Wash. Biological Lab.
For primary bibliographic entry see Field 5C.
W77-05419

SALMON PRESPAWNING MORTALITY STUDIES AT ROCKY REACH DAM AND PRIEST RAPIDS DAM, WASHINGTON FROM SEPTEMBER TO NOVEMBER, 1965,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5C.
W77-05457

THERMAL PREFERENDA AND BEHAVIORAL THERMOREGULATION IN THREE CENTRARCHID FISHES,
Pennsylvania State Univ., Wilkes-Barre.
For primary bibliographic entry see Field 5C.
W77-05571

AN EVALUATION OF THE IMPINGEMENT OF FISHES AT FOUR DUKE POWER COMPANY STEAM-GENERATING FACILITIES,
Duke Power Co., Charlotte, N.C. Environmental Sciences Unit.
For primary bibliographic entry see Field 5C.
W77-05595

PRELIMNARY ASSESSMENT OF LARVAL FISH ENTRAINMENT, COLBERT STEAM PLANT, TENNESSEE RIVER,
Tennessee Valley Authority, Muscle Shoals, Ala.
For primary bibliographic entry see Field 5C.
W77-05596

THE INCIDENCE AND EFFECT Oi ONCE-THROUGH COOLING ON YOUNG-OF-THE-YEAR FISHES AT LONG POINT BAY, LAKE ERIE: A PRELIMINARY ASSESSMENT,
Ontario Ministry of Natural Resources, Port Dover.
For primary bibliographic entry see Field 5C.
W77-05597

SURVIVAL OF JUVENILE FISHES RECEIVING THERMAL AND MECHANICAL STRESSES IN A SIMULATED POWER-PLANT CONDENSER,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05C.
W77-05598

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

IMPROVING INFORMATION DISSEMINATION AND TECHNOLOGY TRANSFER IN THE WATER RESOURCES FIELD,
Missouri Water Resource Center, Columbia.
For primary bibliographic entry see Field 06B.
W77-05102

NATURAL METHODS OF PURIFYING WASTE WATERS AND UTILIZING THEM IN AGRICULTURE, BIBLIOGRAPHY, PARTS 1 AND 2,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 05G.
W77-05306

SEAMALERT, CURRENT SURFACE-MINED RECLAMATION LITERATURE ALERTING SERVICE.
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 05G.
W77-05373

MARINE POLLUTION RESEARCH TITLES.
Marine Biological Association of the United Kingdom, Plymouth (England). Marine Pollution Information Centre.
For primary bibliographic entry see Field 05A.
W77-05383

SUBJECT INDEX

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Distributions of Water and Herbicide in Lakeland Sand During Initial Stages of Infiltration,
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ABIOGENIC GAS SUPERSATURATION

Abiogenic Gas Supersaturation of River Water,
W77-05467 5C

ABLATION

A Stochastic Snow Model,
W77-05489 2C

ABSORPTION

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Final Environmental Statement. Vol I, Proposed 1975 Outer Continental Shelf Oil and Gas General Lease Sale Offshore Southern California (O.C.S. Sale No. 35).
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Final Environmental Statement. Vol 3, Proposed 1975 Outer Continental Shelf Oil and Gas General Lease Sale Offshore Southern California (O.C.S. Sale No. 35).
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Final Environmental Statement. Vol 4, Proposed 1975 Outer Continental Shelf Oil and Gas General Lease Sale Offshore Southern California (O.C.S. Sale No. 35).
W77-05539 6G

Final Environmental Statement. Vol 5, Proposed 1975 Outer Continental Shelf Oil and Gas General Lease Sale Offshore Southern California (O.C.S. Sale No. 35).
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BYK GULDEN RESEARCH CENTRE, KONSTANZ (WEST GERMANY).

A Stochastic Point-Process Model for the Occurrence of Major Freezes in Lake Constance,
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CALIFORNIA STATE RESOURCES AGENCY, SACRAMENTO. DEPT. OF WATER RESOURCES.

A Water Quality Data Report of the Coordinated Monitoring Program. Methods and Data for 1974.
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The Effect of Gas Content of Water on Larval and Young Fish,
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Air Pollution Control Costs and Consumption Pattern Effects. A Regional Analysis,
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ENVIRONMENTAL PROTECTION AGENCY, SEATTLE, WASH.
Summary Report, Nitrogen Supersaturation in the Columbia and Snake Rivers,
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Supersaturation...Crisis on the Columbia and Snake Rivers,
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ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. DIV. OF OIL AND HAZARDOUS MATERIALS.
Field Detection and Damage Assessment Manual for Oil and Hazardous Material Spills.
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ENVIRONMENTAL RESEARCH LAB., NARRAGANSETT, R.I.
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Using Representative Watersheds to Manage Forest and Range Lands for Improved Water Yield,
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Experiments of Nitrogen Gas Disease with Rainbow Trout Fry, (In Japanese),
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GEOLOGICAL SURVEY, LINCOLN, NEBR. WATER RESOURCES DIV.
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Water Resources Data for California, Water Year 1975--Volume 4. Northern Central Valley Basins and the Great Basin From Honey Lake Basin to Oregon State Line,
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GEOLOGICAL SURVEY, MENLO PARK. WATER RESOURCES DIV.
Water Resources Data for California, Water Year 1975--Volume 3. Southern Central Valley Basins and The Great Basin from Walker River to Truckee River,
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GEOLOGICAL SURVEY, OKLAHOMA CITY, OKLA. WATER RESOURCES DIV.
Ground-Water Levels in Observation Wells in Oklahoma, 1971-74,
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GEOLOGICAL SURVEY, PORTLAND, OREG. WATER RESOURCES DIV.
Lakes of Oregon: Volume 4. Clackamas County,
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SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W77-05198--05202 05305--05311	12
Cornell University, Policy Models for Water Resources Systems	W77-05187--05188 05191--05194 05237--05258	28
ERDA Oak Ridge National Laboratory, Nuclear Radiation and Safety	W77-05490--05491 05541--05598	60
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W77-05169, 05195 05197 05315--05328 05330--05332 05496--05522	47
Illinois State Water Survey, Hydrology	W77-05140--05158 05160--05165 05167--05168 05172--05186 05338 05340--05366 05420--05453	104
National Water Well Association, Water Well Construction Technology	W77-05207	1
University of Arizona, Arid Land Water Resources	W77-05206	1
University of Florida, Eastern U. S. Water Law	W77-05209	1
University of North Carolina, Metropolitan Water Resources Planning and Management	W77-05284--05290 05292--05303	19

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SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE (CONTINUED)		
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University of Wisconsin, Water Resources Economics	W77-05214--05219 05221	7
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W77-05103--05111 05170 05210--05212 05312--05314 05333--05334 05336--05337 05367--05372 05482--05489	34
C. OTHER		
BioSciences Information Service	W77-05101, 05159 05166, 05171 05189--05190 05196, 05203 05205, 05220 05226, 05291 05304, 05329 05339, 05414 05454, 05478 05492--05495	22
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SOURCE	ACCESSION NUMBER	TOTAL
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